ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXII. No. 3397. JANUARY 1, 1943 6d. WEEKLY

Industrial Activity

Expansion and Post-War Prospects

THE annual stocktaking which is customary at the close of the year is nowadays a very vague and incomplete operation. There is much that we do not know and a great deal of what we do know must not be written about. Nevertheless, regarding the electrical industries as a group, it can safely be said that they are doing well when measured by the "yardstick" of electricity output. While this figure reflects to some extent increased use of existing plant, it also suggests that a large amount of new machinery and equipment has been put into operation.

Skilful Conversion

This is borne out by the reports of most of the leading electrical manufacturing concerns which have maintained or increased their turnover and continued to pay their usual dividends, in spite of higher taxation. It may be considered by some that this prosperity is artificial and due entirely to war conditions. No doubt there has been expansion, but most of the work represents a skilfully executed change from peace to war production. This encourages the hope that the reverse operation will be achieved without upheaval when the time comes.

Many firms have had to direct their energies into unaccustomed and quite unorthodox channels, electrically speaking, but to a great extent their contribution to the war effort has been an intensification of their normal activities, with the necessary adjustments to meet war conditions.

Although it may be feared that after the war industrial electrical equipment will be at a discount, it is true to say that a large proportion of it is being "worked to death." Moreover, the generous margins allowed in peacetime are being severely trimmed to save time, labour and material. For these reasons much of the plant will not survive so long as its peacetime equivalents.

At the same time, our rapid and intensive industrial expansion has been accomplished very largely with the aid of electricity, a lesson which industry will have learned thoroughly before the end of the war. We can therefore look forward with a certain amount of confidence to a greater demand from industrialists for electrical equipment in connection with the driving and lighting of their works and also for processes in which electricity has proved most efficient and convenient.

Affording the Cost

It will no doubt be asked how the money for this equipment is to be provided by a nation impoverished by war. We cannot yet see what the situation will be in the post-war world. International competition may be rigidly controlled or it may be allowed free play as before, although resolute pronouncements to the contrary are being made on all sides. But whatever conditions prevail, there will be no room for slackness and outmoded methods. Therefore the question must be countered by another:—How is this country, which must remain predominantly industrial, to survive unless it possesses the most up-to-date and efficient means of production?

Domestic Heating Economy

BEFORE the war the coal interests were beginning to look askance at the progress of electricity and gas usage in houses. It seemed to them that less coal would be used in power stations to produce a given amount of usable heat than would be required by the notoriously inefficient coal fires and ranges. One would not have thought that this consideration had any weight at the present time, but there has recently been a hint of it in a Glasgow paper. A writer deprecated the use of electric and gas heaters for short periods instead of coal fires, considering that these methods absorbed more fuel. Mr. A. C. Cramb very effectively dealt with this fallacy in a letter to the newspaper concerned which is mentioned in another page of this issue.

Superposed Generating Plant

AN old station of a large power company in the United States has been extended with high-pressure "topping" plant consisting of three 425,000 lb. per hour boilers having steam conditions of 1,325 lb. per sq. in. and 925 deg. F., and a 50,000-kW turbine. The exhaust from the latter, at 230 lb. per sq. in. and 580 deg. F., serves 90,000 kW of existing turbines. Six months' performance, according to *Power*, indicates that the thermal efficiency of less than 15 per cent. formerly obtained has improved to 24 per cent., the new plant when operating alone giving about 27 per cent. Better results would no doubt have followed the installation of a complete turbine, but the limited supply of condensing water presented difficulties.

Engineering Co-operation

THE agreement between the British Electrical and Allied Manufacturers' Association and the British Engineers' Association announced in this issue is an indication of the growing feeling that the engineering industry needs to sing in tune instead of chanting separate variations on the same theme. The idea is that other kindred associations shall learn from the results of this *rapprochement* the benefit of collaboration and join in. Co-operation between the various organised bodies in the engineering industries is already practised with regard to labour matters in the shape of the Engineering and Allied Employers' National Federation and so the arrangement is not exactly a revolutionary one.

Refrigerator Service

MUCH closer co-operation between makers of commercial refrigerator plant and their service agents will result from meetings held recently with the primary object of securing economy in petrol and tyre consumption. Arrangements have been made to do away with overlapping by fixing a 25-mile limit to be exceeded only in special circumstances. The contacts established at the aforesaid meetings are having another, more permanent, result, namely the reconstitution of the Commercial Electric Refrigeration Association to give representation (in separate sections) to service agents and distributors, as well as manufacturers and insulation contractors.

Fuel Limitation

WHILE the fuel economy campaign has not been unsuccessful, the Minister of Fuel and Power apparently considers it wise to make sure that henceforward there will be no increase in the domestic consumption of gas and electricity. This measure is not strictly rationing and, unlike the Beveridge scheme and the original rationing proposals, can be enforced without imposing hardship. The method may not be perfect, but at least it has the merits of convenience and simplicity. If further limitation becomes necessary this Order provides a convenient first step to rationing based on past consumption which, after all, seems to be the only practicable method.

Maintenance

THE Memorandum of the Senior Electrical Inspector of Factories on the Electricity Regulations (Form 928) is aptly referred to in the newly issued B.S. 1086, Maintenance of Electrical Switchgear, as a very useful commentary on the subject which should be available to those responsible for maintenance work. Yet its publication, we learn, has been suspended—and this at a time when, with the scarcity of skilled electricians, the need for it is greatest. The Memorandum should be reprinted without delay. It surely represents a very much better use of paper than many official documents which are being issued at the present time.

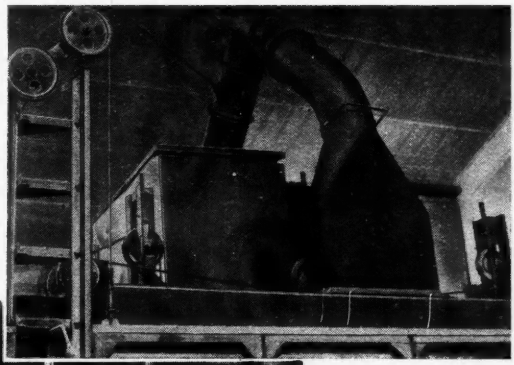
Aluminium Production

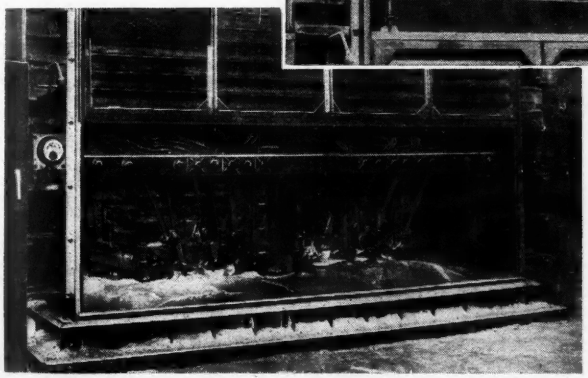
Electrolytic Processes Demand Very Heavy Current

THE basic material from which aluminium is produced is bauxite, a rusty-looking ore which contains 50 to 60 per cent. alumina and varying quantities of other materials such as silica and iron oxide. The first process is to separate the alumina (Al_2O_3) from foreign matter, which is removed as sludge by dissolution in sodium lye. The sludge has little or no commercial value and is usually dumped into the sea, and for this reason, as well as the necessity of handling very large quantities of ore and fuel, most of the alumina works throughout the world are located on or near the seashore. The alumina is recovered from its solution by precipitation, and is afterwards washed and calcined. About one ton of alumina is obtained from double the quantity of bauxite and is usually stored in silos.

The aluminium is produced in furnaces using the electrolytic process of Héroult. The furnace consists mainly of the anodes and the cathodic bath, the latter being a steel shell completely lined with carbon. The furnace is filled with molten cryolite (aluminium sodium fluoride) and the anodes dip into this bath. The alumina is stirred into the cryolite, where it easily dissolves. Once alumina is dissolved the direct current passing from the anodes through the flux reduces the alumina into aluminium, which settles at the bottom of the furnace, and oxygen, which rises against the anodes, gradually burning these away.

The furnace works usually at about 5 V. When the alumina concentration in the cryolite reaches a certain minimum the furnace shows the so-called " anodic effect." At this stage the resistance between anode and metal suddenly becomes very much greater and the voltage drop across the cell may increase from 5 to 40 or more volts. A 50-V lamp across the furnace, which does not show a light at 5 V, lights up at this voltage increase and indicates to the furnacemen that a fresh charge of alumina is required. After stirring in new alumina the voltage falls to the normal.



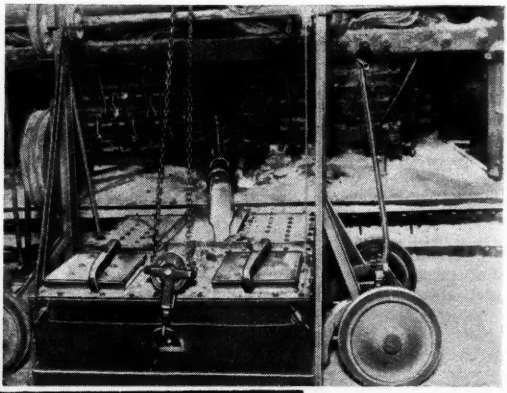


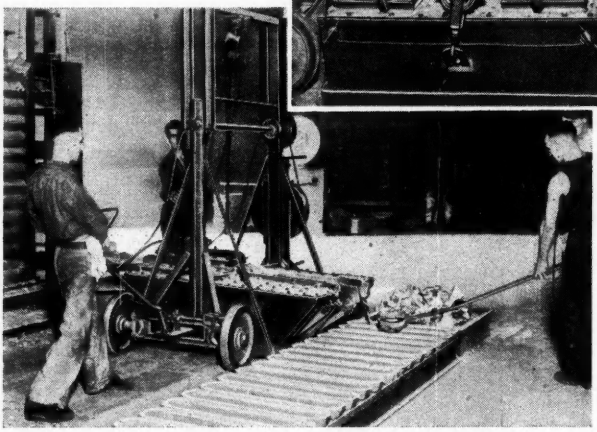
Above : The anodes are sheathed in pure aluminium mantles into which the carbon blocks are fed at the top
Left: Very heavy busbars communicate with the anode stubs by means of heavy flexible copper connections

The tapping of the furnaces is done at regular intervals. The equipment consists of a cast-iron pot pushed through the flux into the metal layer at the bottom of the furnace and a worm pump driven by a compressed-air turbine. The pump fixed in the above mentioned pot pumps the metal up and delivers it into a tilting truck, from which the metal is afterwards poured

into moulds of the required size. For the air supply in one case there are installed two-stage Hick Hargreaves rotary compressors directly coupled to 75-HP squirrel-cage high-torque low-current motors.

The furnace anodes are of considerable interest. In former days these were small calcined carbon blocks which had to be exchanged about every ten days when they became too short. Modern furnaces are equipped with continuous self-baking Soederberg anodes into which "green" paste is filled from the top and which automatically calcines when it comes into the hot zone over the bath. The size of these anodes, of which there may be one or two per furnace, is naturally very much larger than the old calcined anode blocks.

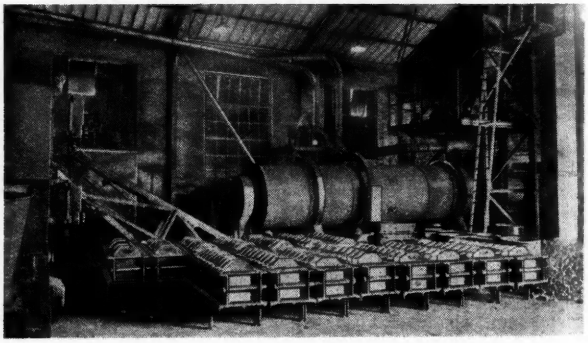




Above: Tapping is effected by a worm pump driven by a compressed-air turbine Left: The tapped metal is poured into a tilting truck and thence into moulds

The anode is held in shape by an aluminium casing and special framework. Around the bottom portion of each anode steel stubs are inserted in the anode and are connected by flexible leads to the busbars, thus conveying the current into the anodes. The anodes are suspended from winches and are periodically lowered to compensate for the burning away by the rising oxygen. As the anodes move down the frames the stubs go down at the same rate, and when these approach the furnace bath they are removed from the bottom and fixed in on the top again.

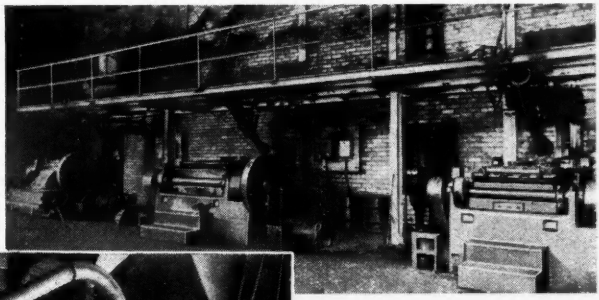
The outstanding electrical feature of all aluminium electrolytic furnace installations is the enormous current required. As each furnace only works at about 5 V the minimum possible number of furnaces are put in series in order that DC machines of the highest efficiency can be used for the current supply. Cheap electricity is absolutely



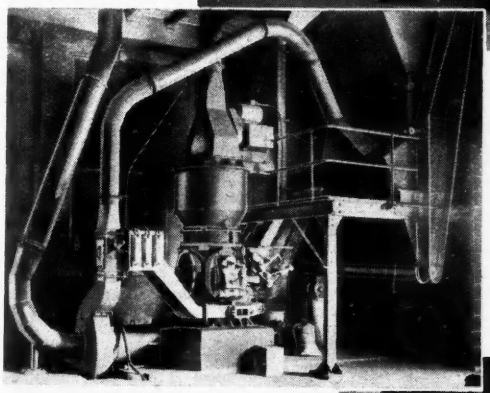
The crushed coke is fed into a rotary drying oven

essential, for which reason it is customary to find aluminium works associated with their own hydro-electric power stations.

The furnace current varies with the size of the furnace and, economically, the larger furnace is preferred because of the lower operating labour required. To refer to a particular installation, the series current is 32,000 A, although furnaces of even higher amperage have been built. Such high current naturally demands very heavy busbars; these are usually placed about 4 ft. above the bath, with very heavy connections to the stubs. The busbars are either aluminium or copper, aluminium usually being preferred in peacetime.



Predetermined quantities of the dry dust are fed into paddle mixers



A 20-HP motor with a double shaft extension drives the pulverising mill on one side and an exhaust fan on the other side

The paste used for the anodes is made from a low-ash-content carbon, for which pitch coke, petroleum coke, or coal coke is the base material. The coke is first crushed to about ½ in. and treated in a horizontal drying drum. It is then ground in a ball mill to the desired grist size. In order to obtain the necessary amount of extra fine carbon powder some of the grist is ground in a "Lopulco" mill driven by a 30-HP motor which produces powder of 200 mesh. Both the ball mill and "Lopulco" mill are equipped with dust-collecting plant.

In the mixing department predetermined quantities of the dry dust are fed into Baker Perkins mixers which operate on the paddle principle and are driven by 20-HP, 740-RPM, motors with Renold chains and reduction-gear transmission. After checking the powder for grist size the hot pitch is poured into the electrically-heated mixers, and eventually the plastic material is poured into moulds to form the blocks which are afterwards fed into the anodes.

All the motors in this particular carbon factory are Laurence Scott totally-enclosed, frame-cooled squirrel-cage machines and the control gear was all produced by Allen West & Co.

A great part of the virgin metal produced by the aluminium furnaces is used to make alloys. For this purpose it has to be re-melted and mixed with the correct proportions of copper, manganese, nickel, etc., according to the specifications required. The products of the re-melting plant are usually in the form of

The hydraulic saw in the finished metal stores

rolling slabs or extrusion billets. Coke- and crude-oil-fired furnaces are employed for the re-melting process.

Before dispatch the slabs and billets are trimmed and cut to size in the finished metal stores, where one equipment of particular interest is a hydraulic saw. This is driven by a 20-HP squirrel-cage English Electric motor which, by means of a multi-reduction gear, drives the saw direct, and the saw carriage and clamping devices for the billets through a hydraulic pump.

NEW BOOKS

Thermostatic Devices. Students' Guide to Telephony.

Temperature Control. By A. J. Ansley. Pp. 127; figs. 81. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price, 13s. 6d.

This is a general review of thermostatic control of temperatures over the range 0 to 1,500 deg. C. The methods described include metal, liquid and gas expansion controls, together with those utilising resistance, thermo-couple and photo-electric effects. Whilst primarily it is a survey of the laboratory type of control apparatus for those who wish to make or assemble their own gear, it also includes descriptions of industrial and commercial forms. Unfortunately the latter are somewhat superficial, and those who are concerned with heat control for industrial processes or with space or water heating equipment will hardly find the information adequate. For example, in describing the commonly employed bimetallic thermostat there is no mention of the important difference in operation on AC and DC.

The book is marred by much careless writing. Thus on page 1, "a change of *heat* causes a volume change" and on the same page "differential is most conveniently *provided*" (probably this means *measured*). Again, on p. 49, the author speaks of "a method whereby the rate of cooling and heating is made *possible*." (Does this mean *variable*?) Apart from these and other obscurities the book provides as good a survey as the allotted space permits of the very wide field covered. Research workers in particular will find the work extremely useful. The various laboratory apparatus, circuits and methods are fully described and amply illustrated, and a large number of references are given to the original papers.—D.J.B.

The Telephone Handbook. By Joseph Poole, A.M.I.E.E., Wh.Sc. Pp. 510; figs. 396. Sir Isaac Pitman & Sons, 39, Parker Street, London, W.C.2. Price 25s.

The title page states that this work is the eighth edition of Poole's "Practical Telephone Handbook," completely revised by N. V. Knight and W. Prickett. It is, however, a completely new work having little or nothing in common with the old Poole so familiar to generations of telephone students. In the preface Mr. Knight explains that the term "Practical" is dropped from the title, and that the new Poole is designed merely to provide a theoretical groundwork for students to cover the greater part of the material for Grades I and II of Telephony and Transmission and Lines in the City and Guilds Institute's examinations.

The authors express the belief that no need for revision of the work will arise since it deals only with basic principles which can readily be adapted to the understanding of future progress. This claim seems unduly optimistic in view of the ever-accelerating progress of telephony.

The preparation of the book has obviously occupied some years, since the 2,000 selector adopted by the Post Office as standard for all new exchanges is now in considerable use, but was not so when the work was written and is not mentioned. It seems unfortunate, too, that UAX and the directors are not dealt with, if only in general principle. A section outlining the fundamental ideas on which systems other than step by step systems, as for example relay, panel, and the new cross-bar systems, are based would have been valuable to those readers whose interest is not strictly bounded by the limitations of an examination syllabus.

The work opens with a 17-page chapter on A.C. theory which includes sections dealing with vectors and complex quantities. Throughout the work some acquaintance with the calculus is presumed. The following chapter dealing with the subscriber's instrument set and its components is admirable. Ensuing chapters dealing with apparatus, manual telephone exchange circuits, relays, batteries and power plant are on conventional lines, but special attention has been given to fundamental circuit elements. Automatic exchange circuits form the subject of chapter 10, the Post Office standard system prior to the adoption of the 2,000 selector being chosen for discussion. The following chapter on automatic equipment and trunking deals with lay-out, traffic and traffic recording very briefly. Trunk exchanges and testing generally form the subjects of what may be regarded as the final part of the first section of the book.

The second section, for which Mr. Prickett is responsible, is devoted to transmission. It comprises chapters on telephone transmission theory, loading, filters, valves, repeaters, submarine cables and finally transmission standards and allowances. A serious attempt has been made to simplify theory, but some acquaintance with the calculus is still essential to adequate understanding. That the attempt has not been entirely successful may largely be put down to the difficulty of the task which Mr. Prickett set himself. In view of the ever-increasing use of the quartz crystal it is to be regretted that there is neither description nor outline of its use in modern telephony.

Any addition to the very meagre literature of telephony is welcome. If the authors have not given an elementary account of all the basic principles which make up modern telephony, they have at least made a serious attempt to perform an extremely difficult if not impossible task.—T.E.H.

Rational Distribution

Scope for Improvements

By F. J. Elliott, M.I.E.E.

IN his chairman's address to the I.E.E. South Midland Centre Major R. H. Rawll ably dealt with the need for reform in the design and provision of apparatus for domestic consumers and the simplification of tariffs—factors of primary importance in obtaining the required development after the war. There are many other aspects of the present organisation which require attention.

The reorganisation of generation under the 1926 Act, while securing unquestionable benefits, has not resulted in a levelling of the price of electricity to distributors, the cost at their busbars varying to an extraordinary degree,* as illustrated by Mr. N. Elliott in the October 30th issue of this journal. Yet the majority of consumers are under the impression that all distributors purchase from the grid at a standard price —a fallacy which should be corrected. Without some drastic alteration in the method of arriving at this charge (which represents some 40 per cent. of the total cost of supply), it cannot be unified. In my opinion, the solution will present itself when a sufficient degree of development has been attained.

Mr. Elliott is Deputy Electrical Engineer and Manager at Wolverhampton

Distribution and utilisation of electricity afford a wonderful field for rationalisation, a field choked with personal idiosyncrasies that prevent standardisation and consequent cheapening of plant and apparatus, a field overgrown with the weeds of red tape precluding the use of common sense in dealing with consumers, the whole surrounded by a mass of forms and documents which divert the efforts of administrators and technicians from their true functions.

The Domestic Field

Manufacturing methods to-day call for an increasing use of electricity; therefore, development in the industrial field is largely a matter of devising means of satisfying demands at a price which industry is prepared to pay. The field possessing the greatest potentialities for development is the domestic one, comprising over 86 per cent. of the total consumers. Any scheme of improvement must remove inhibitions affecting the cost of supplying this class of consumer.

Nearly 50 per cent. of the total capital expenditure of all authorised undertakings has been incurred on account of distribution. The major portion of this expenditure is to enable supplies to be afforded to premises which may use as little as 100 kWh per annum, a fact which entails the strictest economy when preparing schemes for the development of new areas and for meeting increased demands in existing areas. In common with any other commodity, delivery of electricity in bulk presents fewer problems than the delivery of small quantities to many premises.

Development of electricity supply commenced, naturally, in towns, and, except where the local authority has displayed sufficient enterprise and sense of responsibility to obtain Extension Orders, the thinly populated areas have been left to the company-owned undertakings. The degree of development attained in such areas by some of the companies deserves commendation. Parish boundaries, whose origin is lost in the remote past, are still adhered to when an undertaking applies for an Extension Order, and they may pass along the centre of thoroughfares in built-up areas.

Economy in distribution costs should be the major object in rearranging areas of supply, and proper regard should be paid to the need for allocating a reasonable proportion of urban area to any undertaking charged with the development of a rural area.

Agreement Forms

Many forms of agreement are phrased in a manner more suitable for an Act of Parliament or a Statutory Order than for the conditions of supply of a commodity in daily use by over ten million consumers. Company-owned undertakings have been able to obtain a large measure of uniformity and simplification due to grouping and consequential centering at the head office of the holding company of the legal and financial advisers for large areas of supply. In the case of local authority undertakings, there are some 350 clerks and a similar number of treasurers, each one having a voice in deciding the form of agreement and security for payment adopted by the particular authority he serves. Under such conditions the results can be only chaotic.

Some forms of agreement are voluminous

* Below 0·3d. to above 1·5d. per kWh.

and include extracts at some length from the various Acts under which supply is afforded, a large number of paragraphs beginning "The Corporation does not allow," or "The Consumer must." In addition, they quote extracts from the I.E.E. Wiring Regulations, thus ensuring the bewilderment of the man-in-the-street and raising doubts in his mind of the efficiency of the service. At the other end of the scale there are forms containing two or three brief paragraphs setting out conditions of supply in plain English, and space for a list of apparatus to be installed and the consumer's signature. Such a form impresses the consumer favourably. The value of the goodwill obtained by abandoning the practice of insisting upon a deposit or the signature of a guarantor before opening a credit account would more than offset any resulting bad debts.

Voltage Standardisation

The benefits to be secured to consumers, the supply industry and manufacturers by standardising voltages are obvious. In 1938 some 70 per cent. of authorised undertakings gave the whole or a part of their AC supplies at the standard pair of voltages, 230 and 400, but only 50 per cent. of the consumers in the country were supplied at 230 V. There were as many as 36 declared voltages between 100 and 480. Six years earlier this figure was 46, a sufficient indication of the need for acceleration in the rate of standardisation.

The essential features of most distribution apparatus are the same irrespective of locality. Considerable reduction in capital and maintenance costs can be secured by the elimination of special designs, which are often merely an expression of individual views. Most important from the consumer's viewpoint is standardisation of outlets. Consumers should be able to purchase any portable type of apparatus ready for immediate use without calling on an electrician to fit a suitable connector.

In addition to paying local rates through the normal channels, in 1938 consumers of electricity contributed £6,798,000 through the undertakings. This charge was equivalent to a cost per kWh sold ranging from 0·02d. to 0·11d., or 1·9 to 10·8 per cent. of the revenue obtained by the undertakings, or from 3s. to as much as 28s. per consumer, a wide difference in the burden on the undertakings and their consumers however expressed. Uniformity in assessment of local rates must precede any attempt to arrive at unification of tariffs.

Local authority undertakings are subject to an additional charge upon their revenue, the extent of which varies at the will of the Council. Of the 170 local authority undertakings with an output of above 10 million kWh in 1938, some 45 per cent. contributed £585,000 towards easement of the rate burden. Undertakings had to meet a charge on this account varying between 2s. and 12s. per annum—another instance of the lack of uniformity of policy resulting in inequalities in costs and tariffs.

The tendency to offer a special price for a particular domestic use, provided the supply is used only at times specified by the undertakings, is to be deplored. The consumer desires a service at his will and not at times arbitrarily laid down by the undertaking. The prevalent idea of endeavouring to assess accurately the cost of supply to all domestic users for a particular purpose and fixing a tariff accordingly is based on the false assumption that the capital and revenue costs incurred in affording a supply to a given number of premises are the same irrespective of the density of those premises in a particular area, *e.g.*, pre-1914 terrace houses having a density of 25 to 35 per acre, municipal housing sites developed after the last war 12 to 15 to the acre, high-class (for want of a better term) residential sites six to the acre. The theory is also based on the false assumption that all users conform to a standard time-table in their use of electricity for that particular purpose.

When framing a tariff intended to secure development of domestic load it is necessary to assess the cost of supply for all domestic purposes to the whole of the consumers in this category without any attempt at segregating the costs according to the purpose for which the energy is used. Due regard must be paid to the fact that many of the costs remain the same whether only a hundred or several thousand kWh per annum is used at a particular premises.

Budgetary Control

The budgetary system of control has been used for years in many industries and has proved to be sound in regard to distribution costs in at least one undertaking. There is no difficulty in applying such a system throughout an undertaking. The load factor and other items affecting the costs of a particular undertaking do not vary to any great extent from one year to another. It is a simple matter, therefore, to arrive at a reasonably accurate assessment of the revenue per kWh required to meet the cost of supply to domestic consumers, thus enabling a tariff to be devised which is based on the universally accepted principle of reduction in cost per kWh with an increase in consumption without bringing in extraneous factors such as floor area or rateable value.

In 1935 the McGowan Committee mentioned "the complex and chaotic structure of distribution," and that "in practically every case associations and witnesses who appeared before us have stated that the present organisation is unsatisfactory and calls for improvement."

It is regrettable that an industry with reason to be proud of the progress made in many directions has shown that it possesses an insufficient measure of cohesion to bring into being such of the desired improvements as do not require the sanction of Parliament and fall within the scope of some of those Associations admitting the need.

A great majority of those engaged in distribution accept the objective adopted by the Weir Committee in 1925: "reduction in prices and greatest availability of supply." They are not very interested in the particular shape of the controlling body provided they are allowed to devote their technical knowledge, ability and experience to obtaining the desired ends free from all political and other interference.

Such an attitude is not in the best interests of the community or the industry, and I heartily concur in the views expressed by Mr. W. Sutcliffe in his chairman's address to the I.E.E. Scottish Centre (*Electrical Review*, November 6th), in which he advocated that engineers should take a more active part in the affairs of the community.

As a first step in this much-to-be-desired aim, I suggest that engineers concerned with the distribution of electricity should take a part in any post-war scheme of reorganisation commensurate with their knowledge of the subject.

Closer Co-operation

The B.E.A. and the B.E.A.M.A.

IT is beyond doubt that the existence of a well organised and highly efficient body representing the trade interests of the engineering industry in the United Kingdom is indispensable to the safety and economic well-being of this country. Labour matters appertaining to the engineering industry are already dealt with by the Engineering and Allied Employers' National Federation.

The Councils of the British Engineers' Association and the British Electrical and Allied Manufacturers' Association believe that consideration of proposals for the consolidation of the existing organisations in the engineering industry is advisable and they feel it is their duty to give a lead in this matter. To this end it is proposed to begin by arranging a closer co-operation between the two associations, whose memberships collectively embrace the great majority of the more important firms engaged in the manufacture of mechanical and electrical products.

It is realised that the co-operation of other associations concerned with engineering products would be essential in any attempt to provide a common voice for the engineering industry as a whole, and for this reason the co-operation of other kindred trade associations is sought in the work of improving the trade organisation of the engineering industry.

Other Associations Welcomed

It is confidently believed that after a good start has been made on sound lines, natural and therefore healthy development will follow automatically by the co-operation of other associations concerned with engineering products which will provide one voice on common interests of the industry. If at each stage action is justified by results, little advocacy or argument will be required to gain support for a movement towards that fuller organisation.

It is proposed that, in the first instance, intelligently directed co-operation between the B.E.A. and the B.E.A.M.A. shall be achieved by setting up a joint committee on which each of the two associations will be represented by the president, or chairman of council as the case may be, and four members of council who will be elected or otherwise appointed by the council, together with the director.

The joint committee so formed will consider all questions connected not only with the closer co-operation of the B.E.A. and the B.E.A.M.A., but with the whole question of the better integration of the organisation of the mechanical and electrical engineering industry.

Refrigerator Makers' Activities

IN order to save petrol and tyres the members of the Commercial Electric Refrigeration Association have made a number of special arrangements with service agents after holding representative meetings in Manchester, Leeds, Birmingham and London. At these meetings, which were presided over by Mr. E. G. Batt, chairman of the C.E.R.A., representatives of the Ministries of Fuel and Food were present.

It is proposed as an initial step to prepare a register of all recognised agents dealing with the servicing of commercial electric refrigerating plant with particulars of their employees, vehicles and equipment. Those on the register will agree not to undertake any service commitment involving petrol consumption outside a radius of 25 miles from any of their depots except with the approval of a petroleum authority. Special consideration will be given to rural areas, large industrial plants and special technical applications.

Where it would be more economical for another agent to do the work it is to be handed over to him. Any spare part requisitioned from a depot is to be returned without delay if it is not used; alternatively, the old or damaged part is to be deposited at the depot concerned as soon as possible. Efforts are to be made to persuade non-members of the Association to participate in the scheme.

Reconstitution of C.E.R.A.

As a further result of the meetings it has been decided to reconstitute the Association, providing for three or more self-governing sections, each with its own chairman. These are (i) machinery manufacturers; (ii) insulation contractors; and (iii) service agents and distributors. There will be a controlling Council consisting of four members from each section under independent chairmanship. The present title will be retained and in due course the revised constitution and rules will be issued.

Machinery Control Order

Alterations and Additions to Schedule

THE Machinery, Plant and Appliances (Control) (No. 3) Order, 1942 (S.R. & O. No. 2487, Stationery Office, price 2d.) which came into force on December 9th revokes the original Order (1942 S.R. & O. No. 1) and the No. 2 Order (1942 S.R. & O. No. 1175). The Order, which is in similar terms to those of the original one, provides that certain classes of goods shall not be supplied by manufacturers to persons other than those who have received a licence from the Board of Trade.

The original schedule, as amended by the No. 2 Order, is now divided into two sections and a number of the definitions of the classes have been redrafted for clarity. The intention as to the scope of the classes is not altered except in relation to certain of them. Some new items are added, including " 73. Accumulators of a capacity greater than 250 ampere-hours (not being accumulators for use on vehicles) " ; " 74. Conveyors and elevators for use in factories, warehouses or other buildings (not being lifts or escalators) " ; " 77. Industrial trucks and machinery, plant and apparatus for handling goods (except on public roads or railways used for public traffic whether goods or passenger) of any of the following descriptions :—lifting trucks or stacking machines propelled by hand with or without power-operated lifting (including stillages), locomotives or rail trucks, power-propelled trucks (including tractors, trailers and stillages)" ; " 92. Private telephone systems and apparatus (whether or not to be connected to a public exchange network) of any of the following descriptions :— Automatic exchange systems and apparatus (not including telephone instruments), intercommunication systems and apparatus designed for not less than five lines, manual exchange systems and apparatus designed for not less than five lines (not including telephone instruments) " ; and " 93. Apparatus for heating water having either a production exceeding 100,000 B.Th.U.'s or a consumption exceeding 250 cubic feet of gas of any description per hour."

The scope of a number of classes has been altered including the following :— " 58. Industrial suction or pressure cleaning apparatus, and suction, pressure or electrostatic-precipitation apparatus for removing waste, dust, fumes, heated air, steam or vapour resulting from industrial or scientific operations (not including fans of less than ½ HP if used without other equipment) " ; " 61. Steam generating " ; " 67 (2). Furnaces, grates and other combustion plant, and machinery, plant and appliances for use in conjunction therewith (not being blast furnaces, plant used for or in conjunction with the production of gas at gasworks, gas producers, coke ovens, or kilns for making bricks, cement, lime or other building materials or for roasting ores).— .....(e) heated by electricity and rated at more than 5 kW " ; and " 70. Mining and quarrying, being coal cutters, mechanical coal loaders, conveyors, gate end loaders, drills (percussive or rotary), pneumatic coal picks, coal washeries or screens, haulage engines and ancillary equipment, narrow-gauge locomotives, pumps, ventilation fans or winding engines and ancillary equipment."

Attached to the Order is a General Licence authorising the acquisition of goods by persons who have received the approval of certain Government Departments.

Scottish Water Power

Views on Cooper Report

OUR Glasgow correspondent reports that the hydro-electric proposals of Lord Cooper's Committee have had a favourable reception in Scotland, although until the details have been closely studied it is too early to say if there is likely to be any strong opposition to the report.

Lochiel, Convener of Inverness-shire, foresees difficulties in rating and valuation proposals, but welcomes the setting up of a Board, which, he states, they have been trying to get for some time.

Lord Provost Mitchell, Aberdeen, supporting the scheme, says that one good feature is that the scheme is not for the distant future, but that the necessary steps are being taken to make the proposals a reality within a very short time.

Mr. W. Henderson, Convener of Perthshire, welcomes the report. He has always advocated, he says, that the people in the country areas should have electricity as a public service in the same way as the Post Office carries our letters.

In the opinion of Sir Patrick Dollan, Glasgow, the plan would regenerate the Highlands, provided the Government organises essential works to take advantage of the electricity supplies.

Sheriff-Substitute Thomas Cassells, Fort William, ex-M.P. for Dumbartonshire, says that the Report constitutes a new charter and a new hope for the Highlands. The Cooper Committee has discharged its responsibility well. Let the people of Scotland and the Highlands react to the best possible national advantage.

Dr. Evan Barron, Inverness, regards the report as a complete vindication of the attitude adopted by himself and others in the Highlands towards the attempt to exploit Highland water power by and in the interests of private companies during the past twenty years.

Mr. John M. McCormick, chairman of the Scottish Convention, heartily approves of the Committee's scheme and hopes that its recommendations will be adopted by the Government as soon as possible.

H.R.C. Fuses

Their Discriminative Value on Cable Networks

By S. H. Fowles,
M.I.E.E., M.I.Mech.E.

DURING the past ten years much research has been devoted to the rupturing capacity of high-voltage switchgear and networks. The time has now arrived when it has become necessary to look very carefully into the control of AC and DC medium-voltage networks from a discriminating and protective point of view.

Experience has shown that medium-voltage network switchgear has not grown in rupturing capacity as rapidly as the network capacities ; in consequence, to-day we are to a great extent relying on high-rupturing-capacity fuses to give fault clearance, even to the extent of placing them in series with the main and section switchgear.

The network under my control has grown so rapidly that I have had to look for protection by h.r.c. fuses in the substations and network boxes with a degree of discrimination to deal with any large faults on the network, which must be kept within a limited area of supply. With this in view, a careful examination has been made regarding the characteristics of h.r.c. cartridge fuses of the type used in distribution pillars and underground disconnecting boxes. Data have been collected either by actual tests or from suppliers' catalogues which have led to certain conclusions. Interest has been taken particularly in the question of discrimination, the practical aspect of which does not appear to have received the attention it deserves.

Tests have been made with a view to determining the degree of discrimination obtainable between h.r.c. fuses at different values of overload and prospective short-circuit current, and the results of these tests are shown plotted in the graph, fig. 1. A value representing the difference in the rating of the two series-connected fuses undergoing test has been adopted for the vertical scale to enable some relationship between this feature and the prospective short-circuit current to be determined. This graph shows that there is a boundary line on one side of which discrimination can be expected and on the other discrimination is doubtful. Thus, with a knowledge of the prospective short-circuit current likely to occur at any point on a system, it is possible to determine, with the aid of this graph, the closeness in rating obtainable between any series connected pair of fuses with guaranteed discrimination between the pair.

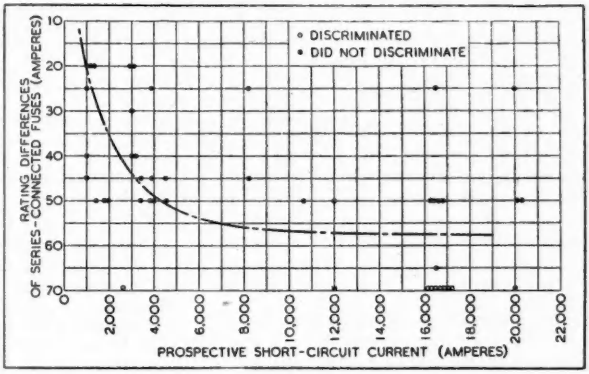


Fig. 1.—Discrimination obtainable between h.r.c. fuses at different values of overload and prospective short-circuit current

Generally speaking, in circuits where fuses of small capacity are likely to be installed, the prospective short-circuit current is limited by the correspondingly small sections of the cables feeding that point. This limitation of the fault current will therefore assist discrimination between the smaller fuses. Where the fault current is likely to be heavy, say, close to a substation, larger fuses will generally be used, and provided series-connected fuses have a rating difference of the order of 100 A, discrimination with heavy prospective currents will be obtained.

In table I (reproduced from *Henley's Information Handbook*) it is shown that the limitation set to the value of prospective short-circuit current by the resistance of the cable is quite appreciable and, unless a particular point on a system is fed *via* a number of circuits, the magnitude of a " short " is not likely to be great, except at points close to a substation.

Several features of the " cut-off " characteristic of h.r.c. fuses, in so far as they affect discrimination, are worthy of examination.

The current in a circuit cannot rise instantaneously to its maximum value, except in a circuit containing resistance only, because of the presence of inductance. The current increases slowly and its magnitude at any instant from the commencement of flow is determined by the amount of inductance in the circuit.

After a given period of time, sufficient heat is generated in the fuse to cause the element to melt, this time being appreciably shorter than would be required for the current to reach its prospective value. Consequently, the fuse interrupts the current before the latter reaches its maximum value.

The value of this "cut-off" current is demonstrated in the graph, fig. 2, for a number of fuses of different ratings. It will be noted that the "cut-off" current of the largest fuse tested is only some fraction of the prospective current at values of the latter in excess of 10,000 amperes. The maximum current that a h.r.c. fuse would have to deal with appears to be somewhere in the region of forty to fifty times the working current, irrespective of the magnitude of the prospective current.

TABLE I.—RESISTANCE, ETC., OF PAPER-INSULATED TWIN AND MULTI-CORE CABLES, PER 1,000 YARDS

Nominal area of conductor	Number and diameter of wires comprising conductor	460 and 1,000 Volts			
		Resistance (max.) including 2 per cent. for lay	Inductance including 2 per cent. for lay	Reactance at 50 cycles	Impedance based on columns 3 and 5
Sq. in.	Inch	Ohms.	Millihenr.	Ohms.	Ohms.
0·007	7/·036	3·566	·2898	·09104	3·5671
0·0145	7/·052	1·709	·2641	·08295	1·7111
0·0225	7/·064	1·128	·2520	·07917	1·1308
0·04	19/·052	·6308	·2298	·07220	·6349
0·06	19/·064	·4164	·2215	·06960	·4222
0·10	19/·083	·2476	·2130	·06692	·2565
0·15	37/·072	·1690	·2027	·06368	·1806
0·20	37/·083	·1272	·1994	·06263	·1418
0·20	37/·093	·1013	·1995	·06268	·1191
0·3	37/·103	·08260	·1974	·06200	·1033
0·4	61/·093	·06147	·1965	·06175	·08713
0·5	61/·103	·05011	·1946	·06114	·07905
0·6	91/·093	·04121	·1929	·06061	·07329
0·75	91/·103	·03360	·1929	·06059	·06928
1·00	127/·103	·02407	·1903	·05980	·06446

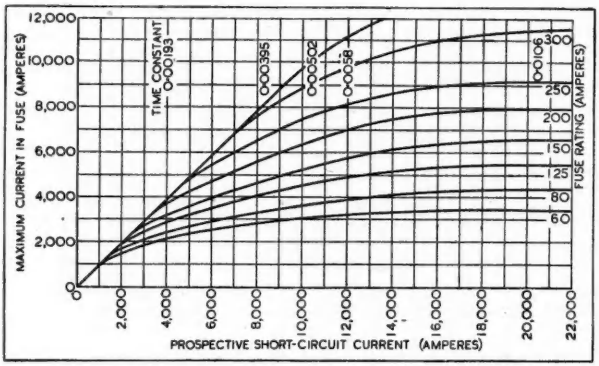


Fig. 2.—Current "cut-off" for a number of fuses of different ratings

The "cut-off" value of a particular fuse affects discrimination in so far as it limits the arc energy liberated within the fuse at the moment arcing commences. This energy is expended during a short period of time, during which the same value of current is also flowing in the fuse of next higher rating in the circuit. It is evident, therefore, that the smaller this current, the smaller will be the heat developed in the element of the fuse of next higher rating. Provided the heat developed in the larger fuse is not sufficient to melt the element, then discrimination between the fuses will be obtained.

Circuit conditions and design of fuse, in so far as its arc-quenching properties are concerned, will influence the rate of decay of the current at rupture, but in designs where a deliberate

TABLE II.—COMPARISON OF FEATURES OF TWO SETS OF TESTS

Oscillogram	Volts	Circuit resistance, ohms.	Prospective current A	"Cut-off" current A	Inductance mH	Time constant	Pre-arcing time sec.	Total operating time sec.	½ LI² Inductive energy	Arc energy, watt-secs.
6	280	0·00985	28500	14300	0·05	0·00507	0·00391	0·0183	5120	9,660
4	280	0·0108	25900	11600	0·135	0·0125	0·00652	0·0173	9100	14,700
7	280	0·0237	11800	5250	1·35	0·0569	0·0307	0·056	18600	30,500

attempt is made to retard the rate of decay of current and so avoid the development of undesirable over-voltage at the moment of rupture, then it is considered that better discrimination will be obtained if the " cut-off " current is limited.

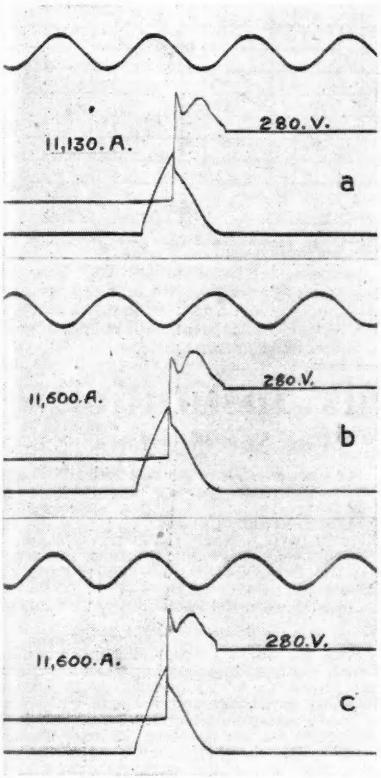


Fig. 3.—Oscillograms of tests on three 300-A fuses

In preparing the curves for fig. 2 a fixed inductance was used and the value of the prospective current was varied by altering the circuit resistance only. This, of course, resulted in a change of the values of the time constant of the circuit, which are indicated for convenience. If a fixed value of time constant could have been maintained for the test at each current setting, then the curves produced would have risen more sharply with increase of prospective current.

Apart from the question of discrimination, the behaviour of h.r.c. fuses under short-circuit conditions, particularly from the viewpoint of consistency of operation and performance in circuits having time constants in excess of the suggested values given in B.S. 88-1939, has been examined.

Three 300-A fuses were tested singly in a circuit having the following characteristics : Voltage, 280 ; resistance, 0·0108 ohm., approximately ; inductance, 0·135 mH. The source of supply during the whole of this test was a lead-acid battery of 5,000 Ah capacity, and the short-circuit current was calculated to be about 26,000 A. The outstanding feature of the three oscillograms obtained in this test (a, b and c, fig. 3) is the remarkable consistency of operation of the three fuses, particularly during the arcing period. The " cut-off " current for two of the fuses was 11,600 A, and for the third 11,130 A ; total operating times are 0·0173 sec. and 0·0174 sec. respectively.

Efficient Energy Dissipation

Similar fuses were tested in circuits having time constants of 0·00507 and 0·0569 (a and b, fig. 4). A comparison between the principal features of these two oscillograms and those in fig. 3 is given in table II.

The energy which has to be dissipated by the fuse when operating in circuits with a high value of time constant should be noted. The fact that a relatively small fuse can dissipate 30·5 kW-sec. of energy silently and with no display in 0·025 sec. is a tribute to the skill of present day manufacturers of high rupturing capacity fuses.

The severity of the test on the last fuse listed in the table is perhaps best illustrated by the fact that the temperature of the outside of the barrel, which was intact, remained at

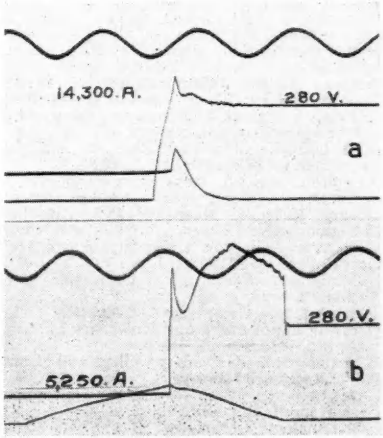


Fig. 4.—Oscillograms of fuse tests in circuits having time constants of 0.00507 and 0.0569

about 100 deg. C. for about ten minutes after the test.

It will be noted from the table that the prospective current for the first fuse listed was over twice that of the last fuse, yet the energy dissipated by the latter fuse was over three times that dealt with by the first fuse. It is unlikely that values of time constant as high as that used for the last test shown in the table will be met with in practice, but it is not easy to compute readily the magnitude of circuit inductance between a fault position and a substation. Some idea of the value of the inductance of the cabling alone can perhaps be obtained from the above table, and the graph, fig. 5, has been plotted from the data given in the table. In this graph, the time constant of the cable has been plotted as a function of the conductor area, and it is interesting to note that the two factors bear a simple relationship and are independent of the length of the cable.

It follows from what has been written above that the selection of a fuse for a particular duty must be made from the knowledge of the circuit conditions.

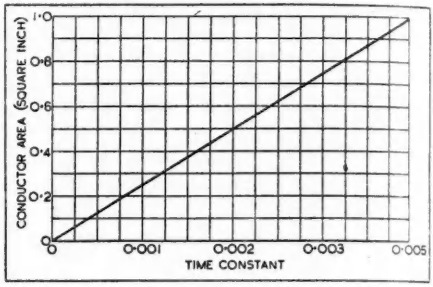


Fig. 5.—Graph plotted from data given in table II

In conclusion I would thank W.T. Henley's Telegraph Works Co., Ltd., for the personal assistance given and the loan of various instruments and apparatus for conducting the tests described in this article.

British Standards Institution

Facilities for Inspection. War Specifications.

THE range of British Standards is now so diverse, and the number of war emergency issues is so large, that no printed list of standards can be up to date. The latest information regarding the issue of new and revised British Standards, of which there are at present over a thousand, can be obtained from the B.S.I. Library at 28, Victoria Street, Westminster. These standards may be studied in the library between the hours of 10 a.m. and 5 p.m., Mondays to Fridays and at other times by appointment. The library contains a large selection of specifications prepared by the standards bodies in Australia, New Zealand, South Africa, Canada, U.S.A., Argentina, Sweden, France, Germany, etc. Extracts from specifications may be made, if desired, and copies of the overseas specifications may be borrowed.

The following libraries, colleges, etc., maintain a complete set of British Standards:—

London.—British Museum, City & Guilds Engineering College, King's College, Science Library (Science Museum) and University College.

Glasgow.—Glasgow University, Royal Technical College and Mitchell Library.

Edinburgh.—Edinburgh University and National Library of Scotland.

Cambridge.—Cambridge University (Engineering Laboratory), and University Library.

Oxford.—Bodleian Library.

Nottingham.—University College and Central Public Reference Library.

Newcastle-on-Tyne.—Armstrong College and Central Public Reference Library.

Birmingham.—Municipal Technical School and Central Public Reference Library.

Leeds.—University of Leeds and Central Public Reference Library.

Manchester.—Victoria University, Central Public Reference Library and College of Technology.

Dublin.—Trinity College.

Aberystwyth.—National Library of Wales.

Cardiff.—Central Public Reference Library.

Middlesbrough.—Central Public Reference Library.

Sheffield.—Central Public Reference Library.

Switchgear Maintenance

With the object of providing in convenient form a record of those matters which experience has shown to be of importance in keeping electrical switchgear and its auxiliary devices in good working condition, the British Standards Institution has just issued at 2s. net, a Code of Practice for the Maintenance of Switchgear (B.S. 1086/1942) which describes the precautions to be observed to secure the safety of personnel during the course of maintenance or reconditioning work.

Guidance is also given regarding safety of equipment and precautionary measures, with an example of a maintenance card to minimise hazards to plant and service. The subject of testing with special reference to AC and DC high-voltage testing as a means for detecting insulation weakness is also dealt with.

Aluminium-Alloy Bars

A British Standard, No. 1080, has just been issued in response to a request for a specification for an aluminium alloy suitable for fuses and fuse parts. The type of alloy covered is similar to that known as B.A. 35. Details of the chemical composition and the mechanical tests are given. Copies may be obtained from the Institution at 2s. 3d. post free.

Cooker Development

Will Simple Hire Methods be Resumed?

By G. A. T. Burdett, A.I.I.A.

A SUBSTANTIAL proportion of the load on the electricity supply networks in Great Britain during the ten years or so before the war was built up by the adoption of simple hire methods. Whether supply undertakings will re-adopt this policy after the war is a matter for conjecture. In contributions to the technical Press and papers read before meetings of engineering institutions and associations there appears to be a growing tendency among supply engineers to favour hire-purchase rather than simple hire methods. The chief advantage of simple hire is its contribution towards rapid development of services other than lighting. The chief disadvantage is insecurity of tenure, for the hirer is under no obligation to retain the appliance once the hire period has expired.

The author points out the disadvantages of simple hire, and suggests that if it is retained cookers should be less substantially built. As a general rule, however, he considers hire-purchase more satisfactory.

In the years immediately before the war gas undertakings either dispensed with simple hire methods altogether or encouraged a further period of service from the old black models by allowing them to be obtained on hire terms. With the introduction of the vitreous enamelled "Regulo" type of gas cooker, convenient hire-purchase terms were made available. This policy was introduced largely to discourage consumers from changing over to electric cooking.

Competition with Gas

It is interesting to study the effect upon the electric cooker business. During the first few months when the new type of cooker was still a novelty and also possessed a high operating efficiency, consumers were not interested in other forms of cooking. Salesmen experienced great difficulty in convincing consumers that the modern electric cooker offered many advantages over the new gas cooker. After a couple of years or so of use when consumers would readily consider electric cooking, in view of the many advantages it offered, they did not care to cut their losses and return their gas cookers, so losing the instalments they had paid. Many of the more enterprising were, however, attracted by the simple hire rates for electric cookers which, in general, were lower than the hire-purchase instalments for the gas cookers. The proportion of consumers who were willing to change to electric cooking where hire-purchase terms only were offered was much smaller.

Results obtained from gas consumers who had completed their hire-purchase instalments were rather varied. Consumers who had looked after their gas cookers and regularly cleaned the jets and so on, found that they still gave good service. As they had purchased their cookers they did not care to take on further commitments. Those who had neglected their gas cookers which, after five years or more, gave constant trouble were often pleased to sell or give away their gas models and adopt electricity. The result was that the type of consumer that the electricity authority desired most was the most difficult to obtain and *vice versa*.

There appears to be no doubt that from the selling and maintenance points of view hire-purchase methods are the most advantageous to supply authorities. On the other hand, as their chief business is to sell electricity and at the same time to render service to their consumers, it is a debatable point whether they should offer hire terms or not. Some consideration must be given to the financial aspect.

Hire and Hire-purchase Finance

The selling price of a medium size electric cooker for a family of five before the war was approximately £10 0 0

Where the hire-purchase period was eight years, with interest at 5 per cent. per annum, the total interest was 4 0 0

Making the total cost to the consumer £14 0 0

Quarterly instalments at this rate would be 8s. 9d. For an identical model on simple hire terms the quarterly hire charges would be approximately 6s. 6d.

Over a period of eight years the total hire charges would be .. £10 8 0

Assuming a trade discount of 10 per cent. to the supply authority, the cost of the cooker would be £9 0 0

Many supply authorities write off this cooker in eight years and thus the rate of depreciation equals 12½ per cent. per annum, which amounts to £1 2s. 6d. per annum.

Allowing maintenance costs at 5 per cent. per annum, the annual maintenance charge is

9s. 0d., totalling over a period of eight years, £3 12s. 0d.

Thus, the total cost to the supply authority for the hired cooker over a period of eight years is	£12	12	0
Amount received from consumer in hire charges is ..	10	8	0
Therefore the " paper " loss to the undertaking is	£2	4	0

The figure of 5 per cent. per annum for maintenance is given as a fair average, but will vary according to the number of cookers on hire by the individual undertaking. Consideration must also be given to the somewhat heavy depreciation charges. The modern vitreous enamelled cooker will certainly have a far longer useful life than eight years. Although it may be written off the authority's books at the end of this period, hire charges and a proportionate amount of revenue from electricity consumed will be received during the rest of its operating life.

Many supply authorities provide free maintenance during the period of hire-purchase of cookers and this must be taken into account when comparisons are made. Further, a good general overhaul is almost invariably made free of charge to the consumer upon receipt of the final instalment. This overhaul may be compared with the renovation given to hired models upon the expiration of a similar period.

Little Financial Difference

From the financial point of view there appears to be little difference between hire and hire-purchase methods. In practice other factors tend to upset calculations. Assumptions have been made in the above figures that each hired cooker will remain on the initial consumer's premises for a period of at least eight years. In most hire agreements the minimum period of hire is one year and then from quarter to quarter. At the end of the initial period the consumer may give a quarter's notice to change his cooker for a more modern one or he may dispense with electric cooking in favour of gas. Consumers are generally discouraged from changing their cookers after so short a period, but receipt of a threat from the consumer that he will revert to gas cooking often tempts the electricity suppliers to surrender. While this type of consumer is more trouble than he is worth, it is policy for the authority to agree to make the change if the circumstances warrant it.

Unfortunately, however short the period of hire, a cooker, once used, cannot be put out for further service until it has been completely renovated. This necessitates the complete dismantling of the cooker so that each part may be thoroughly cleaned. Where the vitreous enamel is badly chipped, new parts are required. Almost invariably new drip tins and oven shelves are necessary. Few consumers will accept an apparently second-hand cooker when they may have a new one at the same rates. Maintenance charges are therefore increased.

Where the circuit wiring has been installed free of charge and the consumer reverts to gas after a short period, either the cable is left installed, when its future revenue earning capacity is problematical, or it is removed. The cost of removing it often exceeds its salvage value.

Premature Obsolescence

One of the main reasons for premature return from hire of perfectly serviceable cookers is the introduction of new models or the modification of existing models. Supply authorities are naturally wary of any deviation from their standard types. Where developments are made and the supply authorities consider it their duty to give their consumers the benefit a compromise is sometimes reached. Consumers are asked to bear the cost of fitting the modification to their existing models. Where this consists of a new hotplate of standard size, or thermostatic control of the oven, the matter is simple, but where the design of the framework is altered a compromise is not possible.

When vitreous enamelled cookers became standard, consumers were encouraged to install black models by being offered lower hire charges. In either case the supply authority loses. This is one of the main reasons why cooker development in Great Britain has followed conventional lines and little changes have been made in design over a period of from fifteen to twenty years. It is well known that in America, where the purchase of cookers is universal, the cookers are not only designed for a comparatively short life, but premature obsolescence is encouraged by manufacturers to tempt the consumers to make changes as early as possible.

Can Cookers be Standardised ?

It is in view of the above factors that supply engineers are considering whether it will be economic after the war to revert to simple hire methods, particularly in respect of cookers. The premature obsolescence factor must be overcome if hire methods are to be retained. This suggests the adoption of a standard appliance. Standardisation up to a point is quite satisfactory, but it tends to throttle development. Who is to say whether any appliance designed upon the cessation of hostilities will be the ideal model for the consumer ?

Engineering research has received a considerable impetus during the war and with all the data available developments in the design of appliances will proceed for some years. A cooker which is the " last word " in design

and utility in the first year of peace may be obsolete after a few years. Should British manufacturers decide to check development once the standard cooker is available (a retrograde step to which no manufacturer would agree) American and Continental manufacturers would capture some of our more lucrative markets.

The choice appears to lie between two alternatives: (a) that cookers shall be made available on simple hire terms but built less "like a battleship" with a view to a shorter life so that manufacturing costs will be much cheaper; or, (b) that simple hire shall be dispensed with, hire purchase made universal and the instalments spread over a period of years representing the average life of a cooker. Payments under these conditions should be as favourable as simple hire charges are at present. The poorer type of consumer would not be penalised, for available statistics show that cooker development has been extraordinarily satisfactory in the poorer districts. Arrangements could be made with the more wealthy consumers for shorter periods of hire-purchase where desired.

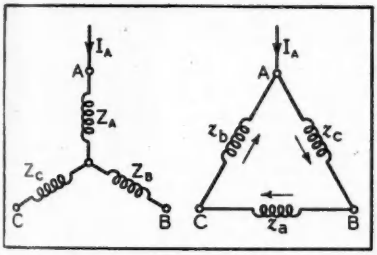
Before simple hire methods are dispensed with we may expect a full investigation into the whole problem. The decision taken will depend upon whether the electricity supply industry has made sufficient inroads into the cooker field to warrant a departure from the pre-war policy of simple hire. As the gas industry discovered, while development may be slower, consumers who are purchasing their cookers are more likely to retain them than if their agreement is from quarter to quarter as in the case of simple hire.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Unbalanced Loads

IN the *Electrical Review* of November 27th Mr. G. W. Stubbings discusses the calculation of the currents in an unbalanced three-phase load. He says that the usual methods for the solution of this problem depend upon the assumption of an objective neutral of the supply, and he then describes a method based upon a corollary of Thevenin's theorem. The formula that he arrives at is



$I_A = I'_A Z_P / Z_A$ in which I_A is the current in limb A of the star, the impedance of which is Z_A, I'_A the current in the link if Z_A is short-circuited, and Z_P the impedance of the three limbs in parallel.

It should be pointed out, however, that this is merely a different way of stating the well-known method employing the star-mesh transformation, in which the star Z_A Z_B Z_C is replaced by the mesh z_a z_b z_c as shown in the figure. For equivalence it can easily be shown that $y_a = \frac{Y_B Y_C}{Y_A + Y_B + Y_C} = Y_B Y_C Z_P$ with similar expressions for the other limbs.

The admittances y and Y are the reciprocals of the impedances z and Z. It should be noted that the lettering of the sides of the mesh corresponds to the opposite corners. The current I_A entering the top corner of the mesh is the difference between the currents in z_c and z_b, *i.e.*,

$$\begin{aligned} I_A &= V_{AB}\, y_c - V_{CA}\, y_b \\ &= V_{AB}\, Y_A\, Y_B\, Z_P - V_{CA}\, Y_C\, Y_A\, Z_P \\ &= (V_{AB}\, Y_B - V_{CA}\, Y_C)\, Y_A\, Z_P \\ &= I'_A\, Z_P / Z_A. \end{aligned}$$

When Mr. Stubbings short-circuits Z_A he applies the voltages V_{AB} and V_{CA} to the two impedances Z_B and Z_C, and his current I'_A is therefore equal to $(V_{AB}\, Y_B - V_{CA}\, Y_C)$. The two methods are therefore identical.

Glasgow. G. W. O. HOWE.

Cable Identification

THE difficulty of differentiating between l.v. and h.v. unarmoured cables is commented on by "Mains" in your issue of December 4th. In the June, 1931, issue of *Electrical Power Engineering* a "cable search apparatus" was described for discriminating between live and dead cables.

The set could be connected at the power station to a live 230-V cable through a 0·5 μF condenser and it would then be easy to identify the particular cable at any point of the run by the note in the telephones.

Ilford. C. C. BARNES.

Electrical Laboratories

I HAVE read with interest Mr. G. H. Rawcliffe's article on technical laboratories in colleges in the issue of the *Electrical Review* dated October 16th and the letters

on the subject from Dr. W. Wilson in the issues of November 27th and December 11th. I agree wholeheartedly with the syllabus proposed by Dr. Wilson in his letter of November 27th.

The syllabus appears to be an ideal one, and I wish to know if it would be possible for Dr. Wilson to amplify it, giving electrical engineers a few more details of the tests he proposes and what results are expected. These figures would be extremely useful.

It is only given to some electrical engineers to carry out in later years tests on rotary machines which are done by them at college, and it is my opinion that the fundamentals of the subject are not expounded to the student sufficiently to enable him to appreciate their value. It is of little use being able to manipulate a number of switches and regulators like an organist on a large organ, when the player does not understand the theory behind it all.

Tests on fuses, motor starters, and circuit-breakers are very useful and a comprehensive syllabus of tests of such comparatively simple things to enable them to be studied would lead to a better understanding of the complicated problems of engineering in later years.

Northwich. D. MACLAREN CATHCART.

PERSONAL and SOCIAL

News of Men and Women of the Industry

TWO turbine drivers have received awards for heroism displayed earlier this year at Barking power station. Mr. W. J. H. Wood, engineer-in-chief of the County of London Electric Supply Co., Ltd., has presented **Mr. F. Winters** and **Mr. R. J. V. Gray** with cheques of £10 each and certificates of heroism from the Carnegie Hero Fund Trust. In March Mr. Winters and Mr. Gray were working at Barking power station when an explosion occurred and they discovered that an electric arc had occurred on the auxiliary switchgear in "B" turbine house. They rushed through quantities of smoke and rescued three of their work-fellows.

Mr. H. Pryce-Jones, deputy city electrical engineer at Liverpool, has been appointed chief engineer and manager to the Brighton Corporation Electricity Department in succession to Mr. W. N. C. Clinch, who is taking up an appointment with the Northmet Power Co.

Mr. H. Pryce-Jones

Mr. Pryce - Jones is chairman of the Mersey and North Wales (Liverpool) centre of the Institution of Electrical Engineers for the current session, and details of his career were given in our issue of August 21st last. He has been with the Liverpool Corporation for fourteen years, and before being appointed to his present position was technical assistant and later chief technical assistant. He is a member of the Institution of Civil Engineers as well as of the I.E.E.

Mr. R. Prain has recently retired from the position of assistant general secretary of the Electrical Trades Union after holding it for twenty-nine years.

In view of the fact that **Mr. N. Barraclough,** who was recently transferred to the position of substation engineer (maintenance) desired to revert to his original post of substation charge engineer (Class C, Grade 8b of N.J.B. Schedule), Hackney Establishment Committee has recommended the transfer instead of **Mr. M. J. Watkins-Ball,** substation charge engineer, who becomes substation engineer (maintenance) at the maximum salary of Class H, Grade 9a of the Schedule.

St. Pancras Electricity and Public Lighting Committee has recommended that **Mr. P. Germain,** junior mains assistant, shall be advanced from Grade 9, Class G, which carries a maximum salary of £342, to Grade 8b, Class G, with a commencing salary of £356 rising to £370.

Mr. J. A. F. Jarritt

Mr. J. A. F. Jarritt, sales manager of Nalder Bros. & Thompson, Ltd., retired on December 31st, on reaching the age of sixty-six, fifty-two years of which have been spent in the service of the company. Mr. Jarritt was educated at East London Technical College, and the Northampton Polytechnic Institute. He joined Nalder Bros. & Co. in 1891 and later, when Nalder Bros. & Thompson, Ltd., were formed, he was engaged in their test room, of which he became head in 1905.

Lieut.-Col. A. Knights, resident manager of the Bury St. Edmunds undertaking, who was reported missing in the Far East, is now known to be a prisoner of war in Singapore.

Mr. H. J. Shipfield, shift charge engineer with the Hackney Borough Council Electricity Department, is retiring this month on account of ill-health.

Mr. C. Farmer, pottery manager at the Tyseley works of the Midland Electric Manufacturing Co., Ltd., retired on December 31st. Mr. Farmer has occupied this position for over seventeen years and was responsible for organising and equipping the first pottery established

by the company and for the development and progress which is reflected in the large section of the new works devoted to the manufacture of electrical porcelain. At a Christmas dinner held in the canteen Mr. Farmer was presented with a modern grandfather chiming clock on behalf of his fellow employees.

Consequent upon the acquisition of the bulk of its ordinary capital by the English Electric Co., Ltd., the directors of D. Napier & Son, Ltd., have resigned. **Mr. G. H. Nelson,** chairman of the English Electric Co., Ltd., becomes chairman of Napiers, and **Mr. H. G. Nelson,** managing director. **Brig.-Gen. Wade, H. Hayes** and **Mr. P. Horsfall** (directors of the English Electric Co.) have also been appointed to the board.

Obituary

Mr. L. Checkley-Barker.—The death occurred on December 21st of Mr. L. Checkley-Barker who had been chairman of the Taunton Electricity Committee since 1931.

Mr. J. W. Hogg.—We regret to report the death, on December 21st, of Mr. J. W. Hogg, distribution engineer with the Sunderland undertaking. He was sixty-four years of age. Mr. Hogg had been connected with the mains side of the electrical industry for the past forty years and prior to 1902 was a contract engineer with Callender's. He subsequently served with the Paisley Corporation and the Calcutta Electric Supply Corporation. He became mains engineer at Sunderland in 1910. From 1913 to 1921 he was with John Bowes & Partners and Armstrong Whitworths, returning then to Sunderland as distribution engineer.

Mr. J. Seidener.—The death occurred at Tel-Aviv on June 4th at the age of eighty-two of Mr. Joseph Seidener. Mr. Seidener was born at Mariapol (Ukraine), and was educated at the Federal University of Zurich. After practising as a mechanical and electrical engineer in Russia he went to Vienna in 1893 where he became one of the outstanding Continental electrical engineers. For twenty years (from 1901 to 1920) he was chief editor of *Elektrotechnik und Maschinenbau.* He visited Palestine on a number of occasions before settling there in 1920, and his plan for the electrification of the country by water power from the Jordan is described in Herzl's novel "Altneuland."

In the Courts

Use of Tramway Reserve Fund

MR. Justice Bennett, in a reserved judgment last week, held that while the Leicester Corporation was not debarred from purchasing a local motor omnibus undertaking it was not entitled to employ any part of the reserve fund of the Tramway Department for the purpose. The action was taken against the Corporation by the Attorney-General at the relation of the Birmingham and Midland Motor Omnibus Co., Ltd., who sought to restrain the Corporation from purchasing and operating the motor-bus business in question.

Breach of Regulations

For a breach of electricity regulations by allowing one man, unaccompanied, to do certain work, Kayser, Ellison & Co., Ltd., were fined £10 at Sheffield recently. Mr. C. B. Rees, Inspector of Factories, stated that a man whose duty it was to oil and clean an electric motor unlocked the door of the switch room and went in. There was an explosion and the man was found lying with his clothes on fire. Usually large concerns had men who operated in pairs on such work, even when they were skilled men. Mr. J. H. Williams, works engineer, said that the man should not have gone on the work without notifying the electrician, who would not have allowed him to do so alone.

The chairman said that the Bench realised that the firm had taken such precautions as it could, but there had been a breach of regulations.

Unfenced Machinery at Power Station

Sheffield magistrates imposed a fine of £10 on the Sheffield Corporation for having unfenced machinery at the Blackburn Meadows power station, as the result of which a man met with a fatal accident. It was stated that an automatic loader worked with two skip elevators, one of which was unfenced. Men were at work near the machine, with a 3-ft. wall between them and the skips. A man put his head over the wall and was decapitated.

In the course of the evidence reference was made to the general high standard of fencing by the Corporation, and for the defence it was contended that the skip had been working in the same condition for nine years, and as the inspectors had not complained it was considered that the machine was in order. Within an hour of the accident fencing was put up.

Forthcoming Events

Institution of Electrical Engineers. — *South Midland Centre.*—Monday, January 4th, 6 p.m. James Watt Memorial Institute, Birmingham. Paper : "The Electric Spark," by Mr. J. M. Meek.

Tees-side Sub-Centre.—Wednesday, January 6th. Paper : "Short-circuit Rating and Testing of Current-Limiting Reactors," by Messrs. J. G. Wellings and R. V. Wheeler.

Northern Ireland Sub-Centre.—Tuesday, January 12th. Paper : "Turbo-alternators : Important Changes that have Influenced their Design," by Mr. D. McFarlane.

Association of Supervising Electrical Engineers.—Saturday, January 9th, 2.15 p.m. Lecture (second of series of three) on "Distribution of Electricity," by Mr. J. S. Blacklock.

Institution of Civil Engineers. — Tuesday, January 12th, 2 p.m. James Forrest Lecture on "The Extreme Properties of Matter," by Sir Charles G. Darwin, K.B.E.

Association of Mining Electrical and Mechanical Engineers.—Saturday, January 23rd. Cardiff. Paper ; "Electrical Breakdowns, Causes and their Prevention," by Mr. W. Todd.

COMMERCE and INDUSTRY

Domestic Fuel Economy. Lamp-making Restrictions.

Fuel Waste Order

THE Minister of Fuel and Power has made an Order, to come into force to-day (Friday) whereby it becomes an offence for householders to use more gas and electricity than in the corresponding period of the previous year. It will not, however, be considered as "waste" if it can be proved that there has been a proportionate saving in another type of fuel, or if there are special circumstances, such as illness.

The new Order (Control of Fuel (No. 3) Order, 1942), which is made under the Defence Regulations, consolidates the Waste of Fuel Order, 1942, and the Control of Fuel Order, 1942, both of which are revoked. It empowers the Minister to control the use of fuel-consuming fittings or appliances, which may be prohibited either generally, by particular classes of persons, or at specified types of premises. Persons authorised by the Minister will have the right to require information, enter premises, and inspect and test fittings and appliances.

Electricity as Coal Saver

A writer in the *Glasgow Herald* recently expressed a doubt whether it was economical to allow electricity and gas "to buttress deficiencies in ordinary coal supplies." Replying to this, Mr. A. C. Cramb, Director and Secretary of the British Electrical Development Association, points out that there are often good reasons why an electric heater is more desirable than a coal fire. This is especially the case with war workers who have little time at home and would be wasting a great deal of coal if they lit a fire. A unit of electricity, representing a consumption of only 1½ lb. of coal, is sufficient to heat a small room for an hour. On the other hand, many pounds of coal are consumed in getting a coal fire going.

The same contributor also mentioned "the enormous loss of calorific value of coal upon conversion into electricity." Mr. Cramb rightly says that this is only half the story for the utilisation efficiency of an open coal fire is seldom higher than 15 per cent. and for cooking purposes in the common solid fuel range the efficiency is even lower. From 20 to 25 per cent. of the heat value of coal used in electricity works is available to the consumer.

Post-war Domestic Services

The British Gas Federation has submitted a report to the Design of Dwellings Sub-Committee of the Central Housing Advisory Committee of the Ministry of Health upon the contribution the gas industry is preparing to make to the improvement of housing conditions after the war. According to the *Gas Times*, the report states that careful planning of the services and appliances intended for fuel supply is of major importance in building design and that the Federation believes that every home built after the war can be provided with smokeless heating, hot water supply on tap, thermostatically-controlled cooking and refrigeration for food storage and that these services can be provided without disproportionate increase in initial costs and at running costs favourable to tenants.

Too often, it is said, tenants have been expected to be satisfied with a single coal-burning appliance for heating the living room, cooking and water heating, all of which functions will be required at different times. Gas or electricity provide each or all of these services at will and, furthermore, provide means of heating at least one bedroom which is essential for illness. These services should be included in all well-equipped houses.

The report goes on to detail the various services, and while it allows that electricity should be used for lighting and small power purposes, it naturally presents the case for gas in the performance of other functions.

Restriction in Lamp Production

In order to reduce the consumption of tungsten and molybdenum wire, which are required in increasing quantities for the production of radio valves, the Board of Trade has made an Order (the Electric Incandescent Lamps (Control) Order, 1942, S.R. & O. 1942 No. 2621), effective as from January 1st, under which the production of coiled-coil lamps is prohibited, with certain exceptions, save under licence from the Board of Trade.

The exceptions are :—(a) lamps of 40 W for voltages of 200 to 260 ; (b) projector lamps ; and (c) special purpose lamps requiring a concentrated light source. The Order does not apply to lamps manufactured to the direct order of a Government Department nor does it in any way restrict the disposal of such coiled-coil lamps as are already made and in stock.

Cheaper Fluorescent Lamps

The Electric Lamp Manufacturers' Association announces that the price of the 80-W. 5-ft. fluorescent lamp is being reduced as from to-day (January 1st) from 36s. 6d. to 30s. Claims in respect of allowance for lamps in stock must be sent to the Association by January 6th.

Mica Distribution

Mica Distributors, Ltd., was registered on December 10th, as a company limited by guarantee without share capital. The original number of members is not to exceed 50. Its objects are to co-operate with the Ministry of Supply in the allocation and distribution in the United Kingdom of mica and other trade matters, to promote and protect the interests of the mica trade, etc. The first members of the Management Committee are : Sir Geoffrey L. Winterbotham, Kt. (chairman), and Messrs. F. J. Fisher, O. G. Irons, T. R. Hart, D. H. Pearson and P. C. Hart.

American Cable Company Charged

It was reported from Washington last week that a Federal grand jury has indicted the Anaconda Wire & Cable Co., of Marion, Indiana, and five of its officers on charges of

conspiracy to defraud the Government in connection with the production and sale of wire and cable for the use of the American forces. The Department of Justice alleged that tests of the materials were faked and that a large part of the wire and cable sent to Russia was defective.

The company has issued a statement to the effect that some weeks ago it came to the notice of its executives that specifications on a product for the Army Signal Corps had not been fully complied with. The product in question formed about 5 per cent. of the output of the company's factories. None of the responsible officers of the company had any knowledge of this failure to comply with specifications and after investigation the employees at fault were dismissed. The company says that it has never received any complaint of the failure of its products in service.

Colliery Fatality

At Dumfries, recently, the Sheriff held an inquiry into the death of a stone miner as the result of injuries received in an explosion in No. 1 Pit, Fauldhead Colliery, Kirkconnel. It appeared that holes had been bored with an electric drilling machine in the stone at the coal face preparatory to a shot being fired. The drilling machine ceased to operate but was repaired by another miner, and when deceased was alone at the coal face an explosion occurred. When assistance arrived the man was found to be very severely injured, and he died the following day. A verdict in accordance with the evidence was returned.

Zinc Alloy Die Casters' Association

The Zinc Alloy Die Casters' Association, comprising most of the leading producers of zinc alloy die castings in this country, has recently been formed, and one of its principal objects is to establish greater co-operation between the industry and Government Departments. Although formed principally to fulfil this object, it is proposed that the Association shall continue to function during peacetime, and much of its work is, of course, applicable both in war and in peace. Among the Association's other aims is the improvement of the technique of zinc alloy die casting, and the promotion of a fuller appreciation of the properties and applications of the castings. The Association is operating from the same office as the Zinc Development Association, which is at Lincoln House, Turl Street, Oxford.

National Coal Board

The first meeting of the National Coal Board took place in London on December 21st, the Minister of Fuel and Power, presiding. Major Lloyd George said that the establishment of the Board completed the final stage in the Government's plan for the wartime reorganisation of the industry as set out in the White Paper on Coal. He added that while the general position was better than was hoped for six months ago, it was by no means as satisfactory as he could wish. If producers and consumers made every effort it should be possible to get through the winter, but the problem of next year was more serious.

In view of the many questions with which the Board has to deal, it was decided to set up a number of sub-committees to deal with the following matters :—

(1) The general planning of production, including the allocation of district and regional targets. The best means of securing the highest efficiency of the coal-mining industry and any improvements in machinery or methods of operation whereby output may be increased.

(2) The provision of supplies, equipment and materials for the conduct of mining operations.

(3) Matters relating to the maintenance of man-power and labour productivity, including the enrolment of new entrants and the instruction, training and advancement of boys and youths.

(4) All matters affecting the welfare of mine-workers, including housing, transport and feeding facilities ; and questions of health and safety and, in particular, such occupational diseases as silicosis and nystagmus, with a view to providing all possible preventive measures, clinical treatment and rehabilitation.

Soft Solder

Further tin economy having become essential, another memorandum (No. 2) to BS.219 has been issued on experience gained of a variety of methods of saving tin used in soft solders. These fresh recommendations are supplementary to the (No. 1) memorandum ; they are not intended to replace the original advice and users are urged always to select solder that will minimise consumption of tin in every individual case. The three groups of solders, in order of tin economy generally effected, are lead-base, argent and those specified in WE/BS.219. A copy of the latest memorandum is obtainable gratis from the British Standards Institution, 28, Victoria Street, London, S.W.1, if a stamped addressed envelope is forwarded.

Jet-Propelled Aircraft

The development of jet-propelled aircraft constitutes a new phase of aviation in which the leading nations of the world are actively interested. Hitherto no work of reference on the subject of aircraft propulsion plants employing combustion gas turbine and compressor combinations has been available. The subject has, however, been dealt with by *Flight* in a series of articles by the managing editor, Mr. G. Geoffrey Smith, M.B.E., surveying thermal jet propulsion systems with rotary, reciprocating or combined units, as well as steam and gas turbines driving airscrews. These articles have now been reprinted in their entirety, together with amendments and additions, in a new illustrated handbook entitled " Gas Turbines and Jet Propulsion for Aircraft," obtainable at 3s. 6d. (3s. 9d. by post) from *Flight*, Dorset House, Stamford Street, London, S.E.1.

Cast-iron Research

The annual report of the British Cast Iron Research Association for 1941/1942, mentions the completion for the time being of work on the welding of cast-iron by the issue of two reports, one reviewing the whole subject and the other concerned with experimental results obtained by a group of members, comparing the strengths of bars welded electrically and otherwise. While the character of inquiries from members has materially changed, their number is

well maintained at five per working day, their nature indicating their importance to the war effort. Routine testing has increased markedly, as has also the work done in the several laboratories ; new premises have been occupied. The list of members who have increased their subscriptions for three years includes more than twenty electrical and allied manufacturers.

Electrodepositors' Journal

The latest issue of the journal of the Electrodepositors' Technical Society is Vol. XVII, covering 1941-42, which is priced at one guinea to non-members. This bound volume of 166 pages with illustrations and index contains an account of the annual general meeting and financial statement, together with a number of technical papers on a variety of subjects debated by the Society, some of which relate to the war effort, while most of the accompanying discussions contain a great deal of practical and topical interest.

Oxford's Savings Record

The recently issued return of membership of local Savings Groups by local authority Electricity Departments for the half-year ended March 31st, 1942, shows that the City of Oxford takes top place among all authorities employing 100 or more people in their electricity undertakings. Oxford's figures were : Number of employees, 195 ; members of Savings Groups, 169 (86·67 per cent.) ; total collected for the half-year, £1,097 13s. 6d. an average of £6 9s. 11d. per member. Incidentally, during the last three years 6,100 Savings Certificates have been subscribed for through this Group, representing an investment of £4,575. The high place occupied by Oxford in this connection reflects the great interest shown by Col. H. G. Fraser, city electrical engineer and manager, in the Department's Savings Group, and his staff are to be congratulated on their very successful efforts.

Renovation of Gauges and Tools

The latest pamphlet issued by the Machine Tool Control (35, Old Queen Street, S.W.1) demonstrates how the useful lives of gauges, milling cutters, drills, reamers, drawing dies, etc., can be prolonged by the means of hard chrome deposits.

Railway Transport Charges

The Ministry of War Transport reminds traders that, as announced early in November, traffic by goods train must be sent " carriage paid " as from January 1st. This means that the consignor must be responsible for paying carriage charges at the forwarding station but does not involve pre-payment if the consignor has an authorised credit account with the railway. The Order, the Railways (Carriage Paid) Direction, 1942 (S.R. & O. No. 2578), has now been made, and as soon as it has been printed copies may be obtained from the Stationery Office.

Sir James Caird Scholarships

Trustees for Sir James Caird's Travelling Scholarships invite applications for one senior scholarship (value £200 to £600) and two junior scholarships (value £50 to £175) for the ensuing year in each of four subjects—engineering, electricity, aeronautics and music. Memoranda and application forms can be obtained from the secretary, Mr. John Pearson, solicitor, 7, Ward Road, Dundee.

Scientists' Conference

Sir Stafford Cripps and Sir Robert Watson-Watt will be the principal speakers at a conference of scientists which is being arranged by the Association of Scientific Workers, 73, High Holborn, W.C.1. The subject will be the " Planning of Science—in War and in Peace," and the conference will take place at Caxton Hall, Westminster, S.W.1, on January 30th and 31st.

Wages in the Cable Making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that the cost-of-living figure on December 1st (100 points above the 1914 level) will not involve any alteration in wages on the third pay-day in January.

Calendars and Diaries

Owing to the paper restrictions, C. A. Parsons & Co., Ltd., have been unable to produce a calendar for 1943. The company has, however, prepared monthly date sheets with gummed edges which can be affixed to the existing 1942 calendar.

We have received from Rhodes, Brydon & Youatt, Ltd., a useful desk diary with weekly sheets, each of which bears a picture of waterfalls in various parts of the British Isles. A fee of 1d. is charged for this and proceeds are being given to the Red Cross funds.

The Spencer Wire Co., Ltd., states that it has a limited number of calendars, for which a charge of 1d. is being made.

Changes of Address

Clegg, Highcock & Co., wholesale electrical suppliers, have removed to 23a, Norton Street (off London Road), Liverpool, 3 (telephone: North 0886).

Communication Engineering Pty., Ltd., have notified us that their new address is 55, Carter Street, Cammeray, North Sydney, N.S.W.

Hartley & Baldwin, Ltd., are now at 7 Newhall Street, Birmingham.

The Leicester depot of the Progress Cables & Accessories Co., Ltd., has been moved to 25 Charles Street (telephone : Leicester 60956)

TRADE MARK APPLICATIONS

THE following is among the recent applications for the registration of British trade marks. Objections may be made within one month from December 16th :—

THERMEX. No. 620,957, Class 9. Electric wires and cables.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

Fuel Economy

Reducing Losses in Industry

By J. N. Waite, M.I.E.E.

Mr. Waite is manager for S.E. England, Central Electricity Board

IT is self-evident that the best way of achieving the objects of the present "fuel economy campaign" is to ensure that the best possible results are obtained from existing equipment with the fuels now obtainable. Improvements by the installation of new plant, better design, better quality fuels, etc., must perforce wait till after the war.

The concluding paragraph of the introductory editorial note in Vol. 21 of the *Fuel Economy Review* (1942), published by the Federation of British Industries (2s. 6d.), epitomises its aim in the following words :—

"One test of efficiency is not how much energy is utilised but how little is avoidably wasted. The energy in coal cannot be destroyed though it may be dissipated or misapplied and, with this fact in mind, it is always useful to examine the heat escaping in such forms as hot water passing to drains, chimney gases at unnecessarily high temperatures or containing undue excesses of air, wastages of steam or heat losses by radiation. In this issue of the *Review*, detailed consideration is given to a number of these items, for, if one takes care of the terminal losses, the plant efficiency will take care of itself."

True economy is making the best use of what is available. Mr. Waite surveys the latest F.B.I. "Fuel Economy Review" in which many suggestions which should lead to the better use of fuel are put forward

In effect, our present job is to cut down all avoidable loss to the minimum possible. There are good reasons for believing that when this is done and becomes a general routine matter, the saving of fuel will be greater than is normally believed possible.

With the foregoing object in view, all the articles have a strictly utilitarian basis. "Economy in the Industrial Use of Electricity" is dealt with by Mr. J. I. Bernard, who sets out to suggest means whereby the utmost economy in the industrial consumption of electric light, heat and power can be obtained, without interfering in any way with the maximum production. The article explains what consumption of electricity means in pounds of coal per week in simple language and by means of diagrams, and brings home the value of savings effected by switching off unnecessary lights and by restricting the running idle of motors, which are largely under the control of the individual operatives. It is a useful article for non-technical people, as it directly indicates the effect of saving in terms of coal saved. This is followed by an article by Prof. A. L. Mellanby on "Fuel Economy in Factory Heating," which deals with its subject in non-technical language in a general way with some sound advice on the undoubted value of heat insulation of buildings with a typical example of the saving to be effected.

An exposition on "Efficient Operation of Heating Furnaces," by Messrs. F. Gray, R. J. Sarjant and H. H. Utley, discusses general principles in a concise manner with the object of improving performance without recourse to serious alterations of either methods or plant. While individual industries have many problems peculiar to the type of furnaces used which need specialised knowledge for their operation, there are certain problems which are common to all types and thus are capable of being studied from a common basis.

The chief properties and uses of natural and prepared fuels are reviewed and useful information is given about their properties, coal being accorded the most attention. The importance of moderate swelling characteristics and high ash-fusion temperature is stressed and the most suitable type of fuel for each class of furnace is indicated. The main elements of furnace design are outlined, together with the essential features for efficient working. Then follow sections dealing with the transmission of heat to the charge, how unnecessary heat losses may be avoided, attention being paid to the part of refractory linings and heat insulation, and how to obtain an idea of the efficiency obtained, with examples of heat balances for a large number of types of furnaces. Altogether a very practical and useful exposition of the subject.

Feed-water Treatment

A short article on the problem of pumping hot feed-water explains what is essential to get the water into the pump. Another useful contribution is one on "Water Treatment for Modern Steam Generating Plant," which outlines the requirements for obtaining a suitable supply of feed water and reviews the main types of water with the treatment

necessary to ensure the minimum of trouble. The types of treatment recommended are divided into three main groups suitable for steam pressures up to 300 lb. per sq. in., from 300 to 500 lb. and above 500 lb.

In an interesting article covering what is called "Internal Treatment of Boiler Feed-water" it is emphasised that the best method is to treat the water before it enters the boiler. In a number of small plants, however, there are no facilities for this, and useful advice is given as to what can be done by treatment by suitable chemicals added to the feed-water or in the boiler itself.

Since publication of the "First Fuel Monograph" in 1921, new values for sensible heat of gases have become available, and these have been used in some notes on "Sensible Heat Losses in the Products of Combustion from Bituminous Coals" to recalculate the heat loss in exit gases. The results are expressed in a family of curves for given CO_2 content, ranging from 4 to 14 per cent. CO_2, over a temperature range of from 300 to 800 deg. F. The latent heat loss arising from the water vapour has been excluded. This amounts to about 4 per cent. of the gross calorific value of the coal. The reason for omitting this undoubted heat loss is that the latent heat is not recoverable in the present state of the practice of heat transfer. I would suggest that it is fundamentally wrong to exclude this loss, for there is no physical reason why the latent heat should not be recovered. Admittedly it is at present commercially inexpedient to do so, but that does not appear to be a logical reason for deducing a considerably lower loss in the exit gases than actually occurs. The value of the curves is depreciated through not including this latent-heat loss.

Other articles deal with "Producer Gas Plant for Industrial Purposes," "Gas Producer Calculations," and "The Selection of Bituminous Coals for Use in Gas Producers."

Discussing "Indigenous Liquid Fuels," Mr. E. Brett Davis outlines what these are and the conditions necessary for their utilisation. An article on "The Removal and Utilisation of Condensate" (condensate being the discharge from steam traps) gives a really valuable study of steam traps, which will be of assistance to many.

In the *Fuel Economy Review* the F.B.I. has made a useful contribution to the fuel economy campaign.

German Fuel Conservation

Wind Power and Economy Measures

AN article in *Vierjahresplan* ("Four Year Plan") clearly shows that the demand for electric power has been growing year by year and that the opening up of scantily populated parts of Europe and the steady development of the densely populated areas are bound to give rise to further demands.

In the article, Staatsrat Schreiber expresses the opinion that wind power must be used. He writes that in medieval times there were about 22,000 windmills in Germany, but there are only 4,500 operating at present. He says that it is necessary, and should be possible, to make use of wind power in all European countries for the following purposes: (1) To convert existing Diesel plants to the combined use of wind power and Diesel engines, in order to save fuel and repairs, in all those districts where conversion to producer gas is not possible owing to the lack of wood. (2) To supply power to service stations on all new roads, railways and other means of communication which are built to open up and guard the country. (3) To be combined with auxiliary producer gas plant in districts where little wood is available. (4) To improve the supply of power to agriculture. There are, for instance, 850,000 German agricultural undertakings which are not connected to main electricity supply.

Schreiber thinks that the construction of wind power plants ought to have a high priority among wartime tasks. The Inspector-General for Water and Power is doing his best to promote the work of developing them. Wind power plants with an output of from 2 to 50 kW would save much liquid fuel and would increase agricultural production. Plants of up to 250 kW would be capable in special cases of supplying power to industrial undertakings, and larger plants up to 10,000 kW should also be considered as a means of saving solid fuels. But the erection of such large wind power works will have to be postponed until after the war.

The Deutsche Nachtrichten Bureau reports that the purpose of Speer (Minister of Munitions, etc.) in advising the return to normal time from summer time, namely, to reduce consumption of electricity during the peak period, has been fully achieved.

Reversion to normal time has had varying effects in the different parts of the Reich, owing to the difference in time of sunset and sunrise. In the Western Gau the normal peak period of electricity consumption has completely disappeared and there has been no noticeable increase in consumption in the evening. In the east, however, the morning peak period has been replaced by a noticeable increase in consumption during the evening peak period, although not a serious one. In the Reich territory as a whole the reversion has resulted in a great saving of power.

A report was recently published of an interview given by a high German official on the question of fuel economy. He said that the consumption of electricity in private households and small industries in the Gau Pomerania was far greater than in heavy industry. If all households were to reduce their consumption of electricity to the absolute minimum, the necessary saving would be effected. As electric fires particularly consumed much electricity it would be best not to use them at all.

ELECTRICITY SUPPLY

Joint Meter Reading. *Stoke Newington Deficit.*

Dundee.—METER READING : J.I.C.'s COMMENT.—With regard to the proposal for joint reading of gas and electricity accounts and also for issuing the respective accounts together, the Electricity Committee has received a letter from the National Joint Industrial Council for the Electricity Supply Industry pointing out that a number of towns have tried joint reading and found it unsuccessful. Three notable instances were Leeds, Manchester and Edinburgh. Pontypridd, with a population of 42,737, had also tried and abandoned joint meter reading. It was the Council's opinion that the proposed scheme for joint reading was impracticable.

Glasgow.—HEATING INSTALLATION.—The Corporation Police Committee is to install an electric heating system at Western fire station.

Leyland.—STREET LIGHTING.—The Urban District Council proposes to have modified street lighting along Golden Hill Lane.

London. — JOINT WORKS COMMITTEE. — In recent years St. Pancras Borough Council has on several occasions considered proposals for the setting up of a Joint Works Committee, and the matter has again been raised by a request from three trade unions that such a committee should be constituted in accordance with a recommendation of the London District Council for Local Authorities' Non-Trading Services (Manual Workers). Similar applications have also been made by the National Union of General and Municipal Workers and the National Union of Enginemen, Firemen, Mechanics and Electrical Workers for the appointment of a committee of this kind for employees of the Electricity Department. The Finance and General Purposes Committee, however, retains its previous opinion that the existing machinery for the settlement of grievances is adequate, and that the interests of the employees as a whole are already fully safeguarded. It points out that the Council has consistently adopted the recommendations of the J.I.C., to which any questions of policy have been referred.

APPLICATION OF SURPLUS.—The same Committee has approved a suggestion by the Electricity and Public Lighting Committee that the profit on the electricity undertaking for the year ended March 31st last shall be retained in the revenue account for the time being to meet any possible contingencies.

STOKE NEWINGTON.—The Finance Committee has recommended that the permission of the Electricity Commissioners shall be sought for the realisation of the electricity reserve fund in order to meet an accumulated deficit of £28,036 in the accounts of the electricity undertaking.

Newcastle-under-Lyme.—ROAD LIGHTING.—The Town Council proposes to provide additional street lighting at junctions and on main traffic routes.

Peterborough.—CANTEEN.—The Town Council has approved the expenditure of £2,000 on the erection of a canteen building for the electricity works.

Wolverhampton.—PURCHASE OF EQUIPMENT.—The Electricity Committee is to provide from surplus revenue £2,000 for meters, £1,000 for services and £150 for substation sites.

Overseas

Australia.—BROWN COAL PRODUCTION.—The Victorian State Government is considering a proposal to increase the production of brown coal from the State Electricity Commission's old open cut at Yallourn. The present output is 1,000 tons weekly.

Germany.—PLANT RECONSTRUCTION IN RUSSIA.—Berlin reports that Reichs Minister Speer, in his capacity of Inspector General for Water and Power and in agreement with the Reichs Minister of Occupied Territories in the East, has founded the Energiebau Ost with a capital of 10 million marks. The object of the company is to plan and control the reconstruction and extension of the power plants in the newly occupied territories in the east. In order to ensure unified control of all power plants ready for work and to take over the power plants newly erected by the Energiebau, the Energieversorgung Ukraine has also been formed.

TRANSPORT

France.—UNDERGROUND STATIONS CLOSED.—The Paris underground stations—St. Sulpice, Picpus, Breguet-Sabin and Pont de Flandre—have been closed down in order to save electricity. They are all some distance from the city.—*Reuter.*

Sweden.—NEW ELECTRIFIED LINE.—Electrification work on the State Railway line between Sundsvall and Ange, a distance of about 60 miles, has been practically completed, and the first electric trains have started running.—*Reuter's Trade Service* (Stockholm).

RADIO & TELEPHONY

China.—TELEPHOTO SERVICE.—A *Reuter* message from Chungking, states that a telephoto service is being inaugurated between China and the United States. The first photos to be transmitted will be those of General Chiang Kai-Shek and President Roosevelt.

Exeter.—RADIO RELAY CHARGES.—Under an agreement with the City Council the Exeter Radio Exchange, Ltd., is permitted to charge 1s. 6d. for a single programme. New plant is being installed which will enable two programmes to be relayed, and the Corporation Streets Committee has therefore agreed to allow the company to increase its charge to 1s. 9d.

Tyneside. — TELEPHONE DEVELOPMENT. — Cheap night calls put through Newcastle exchange during November numbered nearly 5,600, compared with 3,700 in October. There has also been a big increase in the use of the speaking clock "Tim" ; calls of this kind on Tyneside averaged 13,000 weekly before the war and the total is now more than 30,000.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

E. K. Cole, Ltd., report a trading profit for the year to September 30th of £188,179, as compared with £106,522 for the previous eighteen months. Depreciation and directors' fees absorb £22,779 and provision for taxation requires £95,000, leaving a net profit of £70,400 against £32,076 for eighteen months. As already announced, the ordinary dividend is 10 per cent. for the year against 7 per cent. for eighteen months, while the 7 per cent. participating preferred shares receive an extra 3 per cent. Reserve receives £48,547 and the balance carried forward is £11,724 (against £15,289 brought in).

The General Cable Manufacturing Co., Ltd., in its report for the year to September 30th, shows a trading profit of £93,974, as compared with £109,377 for the preceding year, and after deducting directors' and audit fees and placing £72,000 to tax reserve the net profit is £21,079 (against £23,450). As already announced, the final ordinary dividend is 9 per cent., making 15 per cent., subject to tax, for the year (same). Reserve receives £5,000 and the balance carried forward is £3,131 (against £2,801 brought in).

S. Smith & Sons (Motor Accessories) Ltd., report a trading profit for the year to August 1st of £596,066, an increase of £35,410 as compared with 1940-41. Taxation absorbs £322,844 and after crediting interest and deducting depreciation, etc., the net profit is £172,210, an increase of £733. The dividends on the preferred ordinary and the deferred shares are maintained at 17½ per cent. and 37½ per cent., respectively, £10,000 is allocated to write off patents and £20,000 is placed to reserve for research, development and contingencies. The balance carried forward is £52,182, an increase of £4,660.

The Sun Electrical Co., Ltd., reports a trading profit for the year ended April 30th last of £21,836, compared with £22,743 for the previous year. After providing for depreciation, etc., and £1,000 (same) for N.D.C. there is a net profit of £17,232 (against £17,424). The ordinary dividend is maintained at 2½ per cent. and £1,745 (£2,222) is carried forward.

The Electrolytic Zinc Co. of Australasia reports a net profit for the year ended June 30th of £303,916, as compared with £362,784 in the preceding year. The total dividend for the year was 9 per cent. on both preference and old ordinary shares (against 14 per cent.) and 4¾ per cent. on the new ordinary shares. The issue of 400,000 ordinary shares at £1 has been completed and all these are now fully paid. All the 8 per cent. debentures were redeemed in May last. The Risdon leases and power contracts have been renewed for a further 20 years' term expiring on March 31st, 1963. Appropriation for new plant and development of West Coast Mines during the year absorbs £17,000 and the balance carried forward is £212,388.

Joseph Lucas, Ltd., have made an offer to acquire the shares of the New Hudson Co. It is proposed to exchange nine Lucas ordinary shares for ten New Hudson shares and to pay 28s. 6d. for each 6 per cent. preference share and 33s. for each 7 per cent. cumulative "B" preference share.

The English Electric Co., Ltd., announces that its offer to acquire the ordinary shares of D. Napier & Son has been accepted by the holders of over 80 per cent. of the shares and thus becomes effective.

Broom & Wade, Ltd.—In publishing its accounts for the year ended September 30th the company announces that it is proposed to create 440,000 new ordinary shares of 5s. each which, if the issue is approved by the Treasury, will first be offered to the ordinary shareholders.

Telephone Rentals, Ltd., is paying an interim dividend of 4 per cent., the same as last year.

Reduction of Capital

The Oriental Telephone & Electric Co., Ltd.—In the High Court on December 21st Mr. Justice Simonds confirmed a reduction from £900,000 to £600,000 in the capital of the company. The reduction is to be effected by repaying the 188,791 issued £1 preference shares (at 24s. each) and cancelling the 111,209 unissued preference shares. Holders of the issued 570,199 £1 ordinary shares are to receive a return of 20s. per share.

Mortgages and Charges

Brush Electrical Engineering Co., Ltd.—Satisfaction in full (1) on July 24th, 1942, of mortgage debenture in favour of Lloyds Bank, Ltd., dated August 1st, 1939, and registered August 3rd, 1939, and (2) on July 31st, 1942, of trust deed dated October 14th, 1938, and registered October 28th, 1938, securing £150,000 debenture stock. (According to the register of mortgages the debenture registered August 3rd, 193,9 originally secured all moneys due to the bank not exceeding £100,000.)

English Electric Co., Ltd.—Satisfaction to the extent of £24,701 on November 16th, 1942, of 4 per cent. debenture stock secured by trust deed dated May 7th, 1936, and registered May 12th, 1936.

Bankruptcies

E. S. Cheatle (Apex Radio & Electrical Service), radio and electrical dealer, 307, Lyndon Road, Sheldon, lately carrying on business at 580, Coventry Road, Small Heath, Birmingham.—Last day for receiving proofs for dividend January 8th. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, 2, Official Receiver.

J. S. Griffin, electrical engineer, 108, High Town Road, Luton.—Supplemental dividend of 1s. 1d. in the £, payable January 5th at 6, The Parade, Northampton.

J. W. Watson, electrical engineer, 154, Aldborough Road, Seven Kings, Essex.—Application for discharge to be heard on January 11th, at the Shire Hall, Chelmsford.

STOCKS AND SHARES

TUESDAY EVENING.

THE outstanding feature of the year 1942 from the Stock Exchange point of view has been the influence of the cheap money policy of the Government. This has predominated over all other considerations, counteracting any effect which might otherwise have been produced by occasional disappointment felt with the war news. The fundamental factor of cheap money has served to keep prices firm, and to act as a corrective to every other element which, in the ordinary course of events, would have militated against Stock Exchange prices.

As for the volume of business, the year has not been a bad one for market activities: at times, in fact, something approaching animation has developed in various departments, and on the whole it can be said that the year proved satisfactory, regarded from the purely material standpoint of security values and dividend payments. The confidence engendered by the brightening character of the war news, adds sincerity to the hope that 1943 will bring peace and prosperity.

Home Electricity Supply

Questions of war damage, and the way they will be settled, have played a part in the market for Home electricity supply shares. A good deal of discussion has arisen on various points connected with the subject. Apprehension talked of a possible cut in the dividends on account of the need for providing against war damage risks, but the holder of electricity supply shares has ignored such talk and, so far from selling his shares, has been inclined to add to his existing interests. Only on two or three occasions throughout the year has there been any sign of nervousness in this group, and when the spasm passed away, it was succeeded, every time, by a pressing demand for shares that had fallen in price. The ordinary shares now stand upon a level of yield that is considered gilt-edged so far as industrials are concerned, while the available supply of preference issues has steadily diminished throughout the twelvemonth. As for debenture stocks, there is something like a famine in this class of security. Comparison of prices of shares in the London group shows these rises :—

	Dec. 29		
Ordinary shares	1941	1942	Rise
	s. d.	s. d.	s. d.
City of London	26 3	31 6	5 3
County of London ..	35 0	39 0	4 0
London Assoc. Elec. ..	19 6	22 6	3 0
Metropolitan	36 3	40 6	4 3
Northmet Power	35 0	38 0	3 0
South London	25 0	26 0	1 0

In spite of the fact that three well-known London undertakings paid no interim dividend last autumn, the price-changes on the year are in favour of holders. The same upward curve is repeated in the list of ordinary shares in the Scottish and provincial companies. Representative examples are :—

	Dec. 29		
Ordinary shares	1941	1942	Rise
	s. d.	s. d.	s. d.
Bournemouth & Poole ..	53 9	57 6	3 9
Clyde Valley	37 6	40 6	3 0
Elec. Dis. Yorks.	42 0	43 6	1 6
Lancs. Light & Power ..	33 9	35 6	1 9
Midland Counties	37 6	40 0	2 6
Midland Elec. Power ..	39 6	43 6	4 0
North Eastern	29 6	32 6	3 0
Northampton	44 6	47 6	3 0
Scottish Power	38 9	40 0	1 3
Yorkshire Elec.	39 6	41 0	1 6

Home Railway Rises

The Home Railway year has been marked by more ups and downs than have happened in many other markets round the Stock Exchange. Lurking at the back of everything else is the continued fear of what may happen if the Home railway companies are nationalised after the war. The Government has agreed with the railways a figure which is ample to pay the dividends of a year ago, dividends that will be announced in the course of the next few weeks. The agreement runs for a year after the war, and it is contended that the yield on the money now offered by most of the stocks in this group holds out sufficient temptation to discount unfavourable possibilities if nationalisation should be decided upon, and the chance of dividends being slightly increased is a bull point in the situation. London Passenger Transport "C" stock at 55 compares with 40 a year ago. Southern Railway 5 per cent. preferred at 74½ is 10 points up. British Electric Traction deferred has gained 100.

Communication Stocks

Cable & Wireless stocks were a good deal in the limelight during 1942, and investment demand finds reflection in the advances made by both stocks. After the capture of Singapore by the Japanese, followed by the enemy's invasion of Burma and the F.M.S., the prices gave way upon sales by nervous proprietors. But of late the tide has completely turned and the stocks have shared the advancing tendency of the market as a whole:—

	Dec. 29		
Stock or Share	1941	1942	Rise
Anglo-American Pref. ..	105½	109½	4
Cable & Wireless Pref. ..	101½	107½	6
Cable & Wireless Ord. ..	65½	75½	10
Great Northern	14½	23	8½
International Tel. & Tel. ..	3	7	4
	s. d.	s. d.	s. d.
Marconi Marine	27 6	31 6	4 0

Electrical Manufacturing

To the average investor, it may be that the movements in prices of industrial shares are of equal consequence with those of the various groups set out above. For some people, they hold greater interest. Taking at random ordinary shares in well-known electrical com-

(*Continued on page* 29)

E†

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend: Previous	Dividend: Last	Middle Price Dec. 29	Rise or Fall	Yield p.c. £	s.	d.
Home Electricity Companies							
Bournemouth and Poole	12½	12½	57/6	..	4	7	0
British Power and Light	6	6	28/-	−1/-	4	5	9
City of London	7	7	31/6	..	4	9	0
Clyde Valley	8	8	40/6	..	3	19	0
County of London	8	8	39/-	−6d.	4	2	0
Edmundson's:							
7% Pref.	7	7	34/-	..	4	2	4
Ord.	6	6	28/-	..	4	5	9
Elec. Dis. Yorkshire	9	9	43/6	..	4	3	9
Elec. Fin. and Securities	12½	12½	49/-	..	5	2	1
Elec. Supply Corporation	10	10	46/-	..	4	7	0
Isle of Thanet	2	Nil	15/6	..	—		
Lancs. Light and Power	7½	7½	35/6	..	4	4	6
Llanelly Elec.	5½	5½	22/6	..	4	17	9
Lond. Assoc. Electric	4½	4	22/6	−6d.	3	11	1
London Electric	6	6	27/6	..	4	7	3
London Power Red. Deb.	5	5	104½	..	4	15	7
Metropolitan E.S.	8	8	40/6	..	3	19	0
Midland Counties	8	8	40/-	..	4	0	0
Mid. Elec. Power	9	9	43/6	..	4	4	9
Newcastle Elec.	7	7	30/-	..	4	13	5
North Eastern Elec. Ordinary	7	7	32/6	..	4	6	4
7% Pref.	7	7	33/6	..	4	3	7
Northampton	10	10	47/6	..	4	4	0
Notting Hill 6% Pref. (£10)	6	Nil	9½	+1	—		
Northmet Power: Ordinary	7	7	38/-	..	3	13	8
6% Pref.	6	6	30/-	..	4	0	0
Richmond Elec.	6	6	25/-	..	—		
Scottish Power	8	8	40/-	..	4	0	0
Southern Areas	5	5	22/6	..	4	9	0
South London	7	7	26/-	..	—		
West Devon	5	5	22/6	..	4	9	0
West Glos.	4½	3½	21/6	..	3	5	2
Yorkshire Elec.	8	8	41/-	..	3	18	0
Overseas Electricity Companies							
Atlas Elec.	Nil	Nil	4/9	..	—		
Calcutta Elec.	7*	7*	31/6	..	—		
Cawnpore Elec.	10	10	27/-	..	7	8	2
East African Power	7	7	29/6	..	4	15	0
Jerusalem Elec.	7	5	23/6	..	4	5	0
Kalgoorlie (10/-)	7½	5	9/6	..	5	5	3
Madras Elec.	6*	4*	22/6	+1/-	—		
Montreal Power	1½	1½	27	+½	5	11	2
Palestine Elec. "A"	Nil	4*	31/6	..	2	10	9
Perak Hydro-elec.	6	7	9/6	..	—		
Shawinigan Power	83cts.	90cts.	18	..	—		
Tokyo Elec. 6%	6	6	21½	..	—		
Victoria Falls Power	15	15	78/9	−½	3	16	4
Whitehall Inv. Pref.	5	5	20/-	..	5	0	0
Public Boards							
Central Electricity: 1955–60 (Civil Defence)	—	3	99½	..	3	0	4
1955–75	5	5	115	..	4	7	0
1951–73	4½	4½	107	..	4	4	1
1963–93	3½	3½	102	..	3	8	8
1974–94	3½	3½	99	..	3	5	4
London Elec. Trans. Ltd.	2½	2½	96½	..	2	11	10
London & Home Counties 1955-75	4½	4½	109	..	4	2	7
Lond. Pass. Trans.: A	4½	4½	118½	+1	3	16	0
B	5	5	116½	..	4	5	10
C	3	2½	55	..	5	4	8
West Midlands J.E.A. 1948–68	5	5	109	..	4	11	7
Telegraph and Telephone							
Anglo-Am. Tel.: Pref.	6	6	109½	..	5	9	7
Def.	1½	1½	27	..	5	11	1
Anglo-Portuguese	8	8	23/-	..	6	19	4
Cable & Wireless: 5½ Pref.	5½	5½	107½	+½	5	2	4
Ord.	4	4	75½	+½	5	6	0
Canadian Marconi $1	Nil	4cts.	5/6	..	2	17	6
Globe Tel. & Tel.: Ord.	8½*	5*	32/-	..	3	2	6
Pref.	6	6	27/-	..	4	9	0
Great Northern Tel.: (£10)	Nil	Nil	23	..	—		
Inter. Tel. & Tel.	Nil	Nil	7	..	—		
Marconi-Marine	7½	7½	31/6	..	4	15	3
Oriental Tel. Ord.	16	10	57/6	..	3	9	8
Telephone Props.	6	Nil	13/3	..	—		
Tele. Rentals (5/-)	10	10	10/-	..	5	0	0
Traction and Transport							
Angio Arg. Trans.: First Pref. (£5)	Nil	Nil	4/-	..	—		
4% Inc.	Nil	Nil	14½	+1½	—		
Brit. Elec. Traction: Def. Ord.	45	45	1015	..	4	8	8
Pref. Ord.	8	8	170	..	4	14	2
Bristol Trams	8	10	47/3	..	4	4	6
Brazil Traction	$½	$1	22½	+2	-		
Calcutta Trams	8	5½	19/-	..	5	15	9
Cape Elec. Trams	5	5	23/-	..	4	7	0
Lancs Transport	10	10	43/3	..	4	12	4
Mexican Light: 1st Bonds	5	5	93½	..	5	7	0
Rio 5% Bonds	5	5	102½	+1	4	17	6
Southern Rly.: 5% Prefd.	5	5	74½	..	6	14	4
5% Pref.	5	5	110½	+½	4	10	6
T. Tilling	10	10	49/-	−1/-	4	1	8
West Riding	10	10	37/6	..	5	6	8

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Dec. 29	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	7½	10	33/6	..	5 19 4
Assoc. Elec. :					
Ord.	10	10	48/–	..	4 3 4
Pref.	8	8	39/–	..	4 2 0
AutomaticTel.&El.	12½	12½	53/–	..	4 14 4
Babcock & Wilcox	11	11	48/6	..	4 10 7
British Aluminium	10	10	49/–	..	4 1 8
British Insul. Ord.	20	20	£5	..	4 0 0
British Thermostat (5/–)	18½	18½	16/6	..	5 12 1
British Vac. Cleaner (5/–)	10	15	20/6	..	3 13 2
Brush Ord. (5/–) ..	Nil	6	6/9	+3d.	4 12 4
Callender's ..	15	15	75/6	..	3 19 7
ChlorideElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K. (5/–) ..	7	10	15/–	+6d.	3 9 0
Consolidated Signal	17	17	95/–	..	3 11 9
Crabtree (10/–) ..	17½	17½	36/–	..	4 17 3
Crompton Parkinson Ord. (5/–) ..	30	20	24/–	..	4 3 4
E.M.I. (10/–) ..	6	6	19/9	+9d.	3 3 2
Elec. Construction	10	10	39/–	..	5 2 8
Enfield Cable Ord.	12½	12½	58/6	..	4 5 7
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	45/–	..	4 9 0
Ensign Lamps(5/–)	25	25	17/6	..	7 2 10
Ericsson Tel. (5/–)	22*	20*	43/9	..	2 5 9
Ever Ready (5/–)	40	40	35/6	..	5 12 8
Falk Stadelmann	7½	7½	26/–	..	5 15 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. :					
Pref.	6½	6½	33/3	..	3 18 4
Ord.	20	17½	86/–	..	4 1 5
Greenwood & Batley	15	15	35/–	..	8 11 6
HallTelephone(10/–)	10	12½	22/9	..	5 10 0
Henley's (5/–) ..	20	20	23/6	..	4 5 2
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	55/6	+6d.	5 9 0
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	6	..	5 0 0
Johnson & Phillips	15	15	63/–	..	4 15 4
Lancashire Dynamo	20	20	76/6	..	5 4 8
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	..	5 0 0
Lucas, J.	15	15	72/6	+⅛	4 4 0
Mather & Platt ..	10	10	46/3	..	4 6 7
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5¼	+¼	3 19 0
Pye Deferred (5/–)	25	25	19/–	−6d.	6 8 2
Revo (10/–) ..	20	17½	34/6	..	5 1 5
Reyrolle	12½	12½	62/–	..	4 0 7
Siemens Ord. ..	7½	7½	28/–	..	5 7 2
Smith, S. (1/–) ..	50	37½	8/–xd	−6d.	4 3 4
Strand Elec. (5/–)	4	7½	5/6	..	6 16 4
Switchgear & Cowans (5/–) ..	15	10	12/6	..	4 0 0
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	46/–	..	4 7 0
Telephone Mfg.(5/–)	9	9	11/–	..	4 1 10
Thorn Elec. (5/–)	20	20	19/6	..	5 2 7
Tube Investments	25⅜	20	90/–	+6d.	4 9 3
Vactric (5/–) ..	Nil	Nil	8/6	−3d.	—
Vickers (10/–) ..	10	10	18/–	..	5 11 1
Ward & Goldstone (5/–)	20	20	20/6	..	4 17 7
Westinghouse Brake	10	10	57/6	..	3 9 5
Walsall Conduits(4/–)	55	55	41/3	..	5 6 6
West, Allen (5/–)	7½	7½	6/6	..	5 15 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 27)

panies, it will be observed that in every case to-day's prices stand above those of twelve months ago :—

Ordinary shares	Dec. 29 1941 s. d.	1942 s. d.	Rise s. d.
Assoc. Elecl. Ind.	43 9	48 0	4 3
British Aluminium	45 9	49 0	3 3
British Insulated	90 0	100 0	10 0
Callender's	73 9	75 6	1 9
Crompton Parkinson 5s. ..	21 3	24 0	2 9
English Electric	37 6	45 0	7 6
G.E.C.	78 9	86 0	7 3
Ever Ready 5s.	29 6	35 6	6 0
Henley's 5s.	22 6	23 6	1 0
Johnson & Phillips ..	55 9	63 0	7 3
J. Lucas	65 0	72 6	7 6
Siemens	25 0	28 0	3 0
Automatic Tel. & Elec. ..	48 9	53 0	4 3
Crabtree (10s.)	28 3	36 0	7 9
Elec. & Musical Ind. (10s.)	15 0	19 9	4 9
Elec. Construction	34 6	39 0	4 6
Enfield Cable Ord. ..	53 9	58 6	4 9
Ericsson Tel. (5s.)	40 0	43 9	3 9
Lancs. Dynamo	65 0	76 6	11 6
Mather & Platt	41 3	46 3	5 0
Reyrolle	56 3	62 0	5 9
Telegraph Construction ..	41 3	46 0	4 9
Westinghouse Brake ..	51 3	57 6	6 3

Various dollar stocks have participated in the progressive forward movement, Brazilian Tractions, for example, having come up from 12⅞ to 22¼ ; Mexican Light and Power first mortgage bonds at 93½ are 19 points higher on the year.

New Year Prospects

It has become almost monotonous to reiterate, for weeks past, the absorption of front rank shares—more particularly in the ordinary list—by capital which looks to post-war prospects rather than to the current return. The repayment of issues that are falling due, and the national requisitioning of Dominion and other securities, are two of the principal elements which distinguish the Stock Exchange markets at the end of 1942. With a closed capital market, it seems fairly safe to forecast that even better quotations are likely to rule a year hence. Nevertheless, seeing that the increase in capital value is not accompanied, as a general rule, by expansion of income, the possessor of money who wants to invest it probably looks rather ruefully at the manner in which prices of stocks and shares continue to improve, and the yield on them automatically to diminish. But the war news is good and that, after all, is the chief thing that matters in producing a cheerful outlook for 1943.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

28058. "Light polarisers, and process of making same." International Polaroid Corporation. October 29th, 1938. (549668.)

1940

6034. "Light polarisers." International Polaroid Corporation. May 4th, 1939. (549698.)

17056. "Electro-acoustic devices." Standard Telephones & Cables, Ltd., and J. S. P. Roberton. November 29th, 1940. (549701.)

1941

2754. "Radio receivers." S. Y. White. February 29th, 1940. (549769.)

2755. "Scanning radio receivers." S. Y. White. February 29th, 1940. (549770.)

2756. "Methods and apparatus for radio receiving." S. Y. White. February 29th, 1940. (549771.)

3979. "Electric switching mechanism for multiple-way adapters." G. Raft. March 24th, 1941. (549671.)

4396. "Manual control of direct-current electric circuits for the charging of storage batteries." Oldham & Son, Ltd., and R. S. Miller. April 2nd, 1941. (549707.)

4397. "Automatic control of direct-current electric circuits for the charging of storage batteries or for other purposes." Oldham & Son, Ltd , and R. S. Miller. (549708.)

5377. "Electric delayed action relay switch mechanism." Hackbridge Electric Construction Co., Ltd., F. P. Marsh and C. W. Rycroft. April 25th, 1941. (549638.)

5601. "Electric oscillation generators and amplifiers." Standard Telephones & Cables, Ltd., R. M. Barnard and A. Cooper. April 30th. 1941. (549676.)

6636. "Facsimile telegraph equipment." W. G. H. Finch. July 5th, 1940. (Cognate application, 6637/41.) (549775.)

6734. "Control and protective systems for electrical apparatus." A. Reyrolle & Co., Ltd., and A. Felce. May 26th, 1941. (549679.)

6780. "Telephone transmitters and receivers." Standard Telephones & Cables, Ltd., J. S. P. Roberton and M. L. Gayford. May 27th, 1941. (549643.)

6782. "Facsimile telegraph receivers." W. G. H. Finch. May 10th, 1940. (Cognate application, 6783/41.) (549776.)

6784. "Inductive coupling arrangements." Standard Telephones & Cables, Ltd., and E. O. Willoughby. May 27th, 1941. (549644.)

6793. "Turbine blades." Akt.-Ges. Brown, Boveri & Cie. July 31st, 1940. (549681.)

6933. "Electron velocity modulation discharge tubes." Standard Telephones & Cables, Ltd. August 27th, 1940. (549795.)

6974. "Machines for covering electric cables with rubber by extrusion." Standard Telephones & Cables, Ltd., J. Delves-Broughton and P. N. Delves-Broughton. May 31st, 1941. (549713.)

7035. "Electron discharge devices." Marconi's Wireless Telegraph Co., Ltd. May 31st, 1940. (549778.)

7212. "Device for reducing eddy-current losses in stator end plates of dynamo-electric machines." Akt.-Ges. Brown, Boveri & Cie. April 6th, 1940. (549650.)

7277. "Liquid break electric circuit-breakers." British Thomson-Houston Co., Ltd. June 8th, 1940. (549651.)

8040. "Telephone switching and exchange systems and apparatus." Telephone Manufacturing Co., Ltd., and A. C. Brockies. June 26th, 1941. (549714.)

9147. "Electric resistors." British Thomson-Houston Co., Ltd. July 20th, 1940. (549654.)

10108. "Regulating systems for, and the stabilisation of, synchronous dynamo-electric machines." British Thomson-Houston Co., Ltd. August 10th, 1940. (549717.)

10176. "Lead-sheathed cable having a covering of vulcanisable material and a method of making such a cable." Standard Telephones & Cables, Ltd. September 13th, 1940. (549718.)

10225. "Voltage regulating apparatus for alternating current electric circuits." R. I. Bagnall and Foster Transformers & Switchgear, Ltd. August 12th, 1941. (549655.)

11032. "Electric lighting fittings." British Thomson-Houston Co., Ltd., and F. Widnall. August 29th, 1941. (549743.)

11507. "Apparatus for counting and measuring current impulses." Landis & Gyr Soc. Anon. August 3rd, 1940. (549658.)

12044. "Electric meters." British Thomson-Houston Co., Ltd. September 21st, 1940. (549746.)

12576. "Electric lighting fittings." British Thomson-Houston Co., Ltd., E. R. Edinborough and C. W. M. Phillips. September 29th, 1941. (549749.)

12912. "Methods of tuning electric circuits adapted to operate at high frequencies." General Electric Co., Ltd., M. R. Gavin and V. A. Heathcote. October 6th, 1941. (549721.)

13439. "Snap action electric switches." Walsall Conduits, Ltd., and B. A. Perry. October 18th, 1941. (549724.)

13887. "Electromagnetic horn radiators." Marconi's Wireless Telegraph Co., Ltd. October 29th, 1940. (549753.)

14217. "Electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co.) November 4th, 1941. (549663.)

14303. "Electric lighting fixtures." British Thomson-Houston Co., Ltd. November 9th, 1940. (549754.)

14891. "Electric high-pressure metal-vapour discharge tubes." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). November 19th, 1941. (549727.)

14921. "Fluorescent materials." British Thomson-Houston Co., Ltd. (General Electric Co.). November 20th, 1941. (549755.)

15263. "Gas-blast circuit-breakers combined with isolating switches." British Thomson-

Houston Co., Ltd. November 29th, 1940. (549756.)

15337. "Bases for electric lamps." British Thomson-Houston Co., Ltd. (General Electric Co.). November 28th, 1941. (549728.)

1942

362. "Fluid blast electric circuit interrupters." Westinghouse Electric International Co. January 9th, 1941. (549763.)

740. "Unit air heaters." Intertherm Akt.-Ges. Fabrik für Elektrische Apparate, and A. Pfandler. January 19th, 1942. (549766.)

836. "Electrical transformers." Akt.-Ges. Brown, Boveri & Cie. February 12th, 1941. (549767.)

2704. "Charging arrangements for electric accumulator vehicles." Allmänna Svenska Elektriska Aktiebolaget, and W. G. Schmidt. March 2nd, 1942. (549784.)

2797. "Means for testing and selecting electrical circuits particularly in automatic telephone systems." Western Electric Co., Inc. February 8th, 1941. (549785.)

2933. "Refrigerating apparatus." British Thomson-Houston Co., Ltd. March 8th, 1941. (549787.)

7179. "Cross-talk balancing." Standard Telephones & Cables, Ltd. October 23rd, 1940. (549789.)

Amended Specifications

516348. "Automatic or semi-automatic telephone systems." J. E. Pollak.

517264. "Electrical oscillating systems." A. H. Stevens.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—Sydney County Council. January 28th. 440-V auxiliary power switchgear for turbo-alternator (Specification 603). Battery charging equipment (Specification 678). 22-kV metalclad neutral switching equipment (Specification 610).

March 25th, 22-kV metalclad neutral switching equipment (Specification 610).

June 24th. Steam generating plant for Pyrmont power station, section B. (Spec. 650).

July 8th. 50,000-kW steam turbo-alternator set for Pyrmont (Specification 651).

VICTORIA.—State Electricity Commission. March 3rd. 132-and 66-kV outdoor switchgear and accessories (Specifications 42-43/33).

April 14th. 22-kV compound-filled switchgear with all accessories (Specifications 42-43/41).

COMMONWEALTH. — P.M.G.'s Department. February 9th. Transformers (Schedule C4006).

Birkenhead.—January 11th. Electricity Department. Switchgear and transformers. (December 25th.)

Bury.—January 15th. Electricity Department. Electrically-driven capstan. (See this issue.)

Manchester.—January 5th. Electricity Department. Two electrically driven capstans and four bollards. (December 11th.)

Wolverhampton.—January 18th. West Midlands J.E.A. H.v. and l.v. cables. (See this issue.)

Orders Placed

London.—HAMMERSMITH.—Executive Committee. Recommended. 500-kVA, three-phase transformer (£347).—Bonar, Long & Co., Ltd.

KENSINGTON.—Borough Council. Accepted. Supplying and fixing separate switches for the internal lighting of some 3,500 street surface shelters (4s. 6d. per switch).—Leather & Strong.

Middlesex.—County Council. Recommended. X-ray equipment for West Middlesex Hospital (£2,352).—A. E. Dean & Co.

Swansea.—Parks Committee. Accepted. Public address equipment (£242).—Elsmore Radio & Television Co., Ltd.

Wood Green.—Education Committee. Recommended. Overhauling electricity supply at Noel Park school.—Northmet Power Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Andover.—Nursery (£3,257) at King George Road recreation ground; E. J. O. Gardiner, town clerk, Municipal Offices, Bridge Street.

Barrow-in-Furness.—Buildings; Barrow Steam Laundry, Ltd., Abbey Road.

Berwick-on-Tweed. — Additions, Blakewell Road; T. Gardiner, builder, 2, Ivy Place.

Bomersund.—Miners' canteen; T. E. Ridley, 7, Moor Crescent, Gosforth, Newcastle-on-Tyne.

Boston.—British Restaurant at Swineshead for R.D.C. (£1,477); W. R. Beardsall, building surveyor, Council Offices, 15, Market Place, Darwen.

Bradford.—Nursery, Arkwright Street; N. L. Fleming, town clerk, Town Hall.

Buckinghamshire.—Alterations and accommodation for 33 additional patients at the Berks and Bucks Sanatorium; county architect, County Offices, Aylesbury.

Burnmoor.—Miners' canteen; D. & J. Ranken, Stockton Road, Sunderland.

Bury St. Edmunds. — Second British Restaurant; borough engineer.

Chatham.—Additional nursery; R. L. Honey, architect, Town Hall.

Choppington.—Miners' canteen; J. Jackson & Son, Corporation Street, Newcastle-on-Tyne.

Clydebank.—Block of prefabricated houses ; borough surveyor.

Coventry.—Trades hall for Joint Committee of Labour Party, Co-operative Union, etc. ; J. Mort, secretary.

Air-raid shelter, Whitley Abbey (£1,600) ; D. E. E. Gibson, city architect, 1a, Warwick Row.

Croydon.—Building for 200 children at New Addington School site (£3,000), and new nursery ; E. Taberner, town clerk.

Dawdon.—Miners' canteen ; W. G. Tomlin, Marlborough Street, Seaham, Co. Durham.

Dorset.—A.R.P. centre, Dorchester ; County architect.

Durham.—School kitchens at Seaham ; county architect, 34, Old Elvet, Durham.

Miners' canteens ; G. T. Brown, Fawcett Street, Sunderland.

Felling-on-Tyne. — Houses at Wardley ; U.D.C. surveyor.

Gloucestershire.—Technical College and extensions to High School, Stroud; county architect, Shire Hall, Gloucester.

Goole.—Extensions to Co-operative Bakery, Pasture Street ; Secretary, Co-operative Society (Goole) Ltd., Red Lion Street.

Two nurseries; J. H. Castle, borough engineer.

Haverfordwest.—Adaptation of premises, Victoria Place, as Council Offices ; R.D.C. surveyor.

Hereford.—Fire station (£2,698) ; G. Honey.

Horton Grange.—Miners' canteen ; R. Carse & Sons, Oldgate, Morpeth.

Kent.—School buildings at Poverest Road, Orpington ; county architect, Maidstone.

Kirkburton.—British Restaurant, Lepton ; F. Hobson, U.D.C. surveyor.

Leigh.—Fire substation in Bonneywell Road ; T. A. Clare, borough surveyor, Town Hall.

London.— ST. MARYLEBONE.—Offices, 20-2, Mansfield Road ; Binns & Scarlett.

Manchester.—Workshops, Hulme ; P. Cummings, architect, 3, Appleby Lodge, Wilmslow Road, Rusholme.

Works canteen, Chorlton-on-Medlock ; P. Hamer, Ltd., building contractors, Park Street, Swinton.

Offices and garage, Moston; F. W. Churchard, architect, 3, Clovelly Drive, Hillside, Knutsford.

Buildings at Longsight ; W. Kennedy, 14, Portland Road, Longsight, Manchester 13.

Menai Bridge.—Extensions to fire station ; W. Owen, surveyor, Council Chamber, Dale Street.

Middlesbrough.—Additions in Grange Road for L. Thirkell ; T. Crawford, architect, 82, Borough Road.

Newcastle-on-Tyne.—Electrical installations in civil defence depots ; J. O. C. Solomon, city property surveyor.

North Riding.—Central kitchen at Northallerton (£820) ; D. Oakley Ltd., builders, Northallerton.

Dining centre at Guisborough (£1,000) ; W. F. Richardson, builder, Ormesby.

Equipment of parish hall, Marshe, as a school feeding centre ; J. White, county architect, County Hall, Northallerton.

Northumberland.—Establishment of a school clinic at Cambois ; county architect.

Rushden.—Depot and British Restaurant ; J. W. Lloyd, U.D.C. surveyor, Council Buildings.

Stanley.—Miners' canteen at Morrison Pit ; R. C. Williamson, Strathmore Road, Rowlands Gill, Co. Durham.

Stockport.—Extensions to stores ; Stockport Great Moor Co-operative Society, Ltd., Buxton Road, Great Moor, Stockport.

Stourbridge.—Houses ; G. N. Maynard, borough surveyor.

Tynemouth.—Decontamination building for the Tyne Improvement Commission at the Albert Edward Dock ; Marshall, Tweedy and Bourn, architects, Blackett Street, Newcastle-on-Tyne.

Fan chamber at A.R.P. building, Union Road, for the Shields Ice & Cold Storage Co., Ltd. ; Tasker & Child, architects, Trinity Buildings, Newcastle-on-Tyne.

Hostel for the British Sailors' Society ; W. Stockdale, architect, 73, Howard Street, North Shields.

Completion of partially built houses and provision of British Restaurant at Percy Main ; borough engineer.

Wellingborough.—Houses for U.D.C. ; R. Kilby, surveyor, Council Offices, Swanspool, Wellingborough.

Wells.—Central kitchen, Wookey Hole Lane ; borough surveyor.

Whitefield.—British Restaurant at Besses-o'-th'-Barn for U.D.C. ; J. Knight, surveyor, Council Offices, Whitefield, near Manchester.

Wirral. — British Restaurant, Heswall ; U.D.C. surveyor, Telegraph Road, Heswall.

Worcestershire.—Canteen kitchens at Lapal, Halesowen and Cradley Heath Schools ; H. Rowe & Son, county architects, 38, Foregate Street, Worcester.

Can Welding Oust Riveting?

THE possibility that many British shipbuilding yards will swing over to electric welding and prefabrication in the future instead of continuing the system of riveting was suggested at a joint meeting of the Institute of Welding and the Institution of Engineers and Shipbuilders held in Glasgow to discuss the application of flame cutting and automatic welding to shipbuilding. Mr. R. R. Sillifant and Mr. R. E. Dore led the debate in which the adoption of the electrical system, was advocated and claimed that if generally used and properly applied it would mean increased production and efficiency in the repair and production of ships.

The development of electric welding in Britain for shipbuilding had not been so rapid or spectacular as in the U.S.A., but, nevertheless, steady progress had been made during the past few years. Equipment had until recently been adequate to the requirements, but now under the strain of increased production a serious shortage was being experienced. The stimulus of war had overcome much of the prejudice which had prevented shipbuilders from departing from their established and well tried methods.